ARCHIVES

OF

USEFUL KNOWLEDGE.

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ADDRESS

TO THE CULTIVATORS, THE CAPITALISTS, AND MANUFACTURERS OF THE UNITED STATES.

THE times require your enlightened co-operation in the improvement and extension of *the national industry*. An unprecedented course of foreign misconduct, demands equally of your interests and of your virtues, a deportment corresponding with the new situation into which we are drawn. The subject of WAR, as a possible remedy for the disorder of the times, is studiously left to other pens, and is respectfully submitted to the proper authorities of our neutral country. But it is a consideration of the utmost importance, in favour of the public views, which it is proposed to suggest in these papers, that they may tend to manifest our vast resources for a just and necessary contest with any foe; and to indicate the means of their sure and economical improvement and increase.

Under the strongest impressions from these painful, injurious, and awful times, it is proposed to take the necessary view of certain divisions of our internal industry, in which the interests of the cultivators, the manufacturers, and the capitalists, well understood, appear to unite. We shall commence with the great and novel article, the importance of which has been so miraculously increased in the United States, by measures like these, and which

is rapidly advancing to the character of the greatest material for clothing, furniture, and diversified equipment, on the face of the earth.

COTTON.

THE woollen manufactures of Europe constitute one of the greatest rivals of the cotton cultivation of the United States, and of the increasing manufacture, at home and abroad, of that illimitable raw material. It is an instructive fact, that the woollen manufactures of Great-Britain have been steadily computed at a little more than sixteen millions sterling per annum, for the whole period between the peace of 1783, and the beginning of the present war in the year 1803.—The weight of the wool annually consumed there, varies little from the weight of our whole *surplus* cotton, as exported in the greatest year. If our cotton shall be impeded by the belligerents in its way to foreign markets, we must and shall manufacture many cotton goods, so as to rival foreign woollens. The American will not be uncomfortable in his own cotton velvets, velverets, corduroys, swanskins, and cotton blankets. The scarcity of hands is no objection to ginning, carding, spinning and plate printing by horse, by water, and by steam. An effect of their cotton manufacture has been to keep the woollen manufacture stationary in England for twenty years, during which the cotton branch has been raised from less than one million sterling to more than ten millions.

The presence of the raw material will provoke to, excite and produce the manufacture.—This is a plain and a sound maxim.—We find it proved by the course of events, even in the instances of the most unnecessary, luxurious and difficult branches. Thus the presence of the *Grecian* marbles occasioned their formation into the most costly, exquisite, difficult and unnecessary manufactures in the world—*their marble statues.* Italy followed in this superfluous branch, because, *there also was the native raw material, and the Greek marble was adjacent.* France and Great-Britain have not offered to the world *the statuary's wares*, because they had not the marble; although, it is observable, that they have respectively made a distinguished figure in the more

exquisite and complicated relative manufactures of the painter, because importations constantly occasioned *the presence of the raw materials*. So of the people of the whole seventeen provinces of the Netherlands. They could make paintings, but not marble statues.

The presence of the most considerable mass of the best hemp, in Russia, has produced *an unrivalled excellence* in the finer sail cloth, and in the common sheetings of that country.

The various fossils of Great-Britain have produced an immense number of useful manufactures from mineral substances.

The moist climate and rich soil of Ireland produce the best flax in abundance, and the presence of that excellent raw material has occasioned the most celebrated manufacture of linens, which have been offered in the markets of the world.

The American cotton, in like manner, will *surely* produce the home manufacture with a celerity, *proportioned to foreign interferences with its rightful sale in external marts*. A strong collateral ground for this presumption is, that we have insensibly attained the actual manufacture of *all* the other raw materials, which are either the spontaneous productions of the earth, or the fruits of cultivation. The American *metals*, *wool*, *hemp*, *flax*, and *skins*, have, by their mere presence, produced the gradual rise of a body of regular and qualified manufacturers, actually competent to the manufacture, not only of all of them, which we can obtain from the landed interest, but all we can procure by means of importation. We have nothing to do in regard to those last five raw materials, but to increase their quantity, and to ameliorate their manufacture. It is the presence of cotton only, as a *redundant* raw material, which is to produce in the United States a new proof the truth of the maxim, that *the presence of the raw material will excite and produce the corresponding manufactures*.

Many important articles of public supply, for which the country paid excessive prices in the revolutionary war, can be made of the cotton, which Europe interrupts in its way to foreign markets. We were not aware, that we possessed the sources of this profuse raw material; neither had we the gin to free it from

the seed; nor the carding and spinning machinery, with which to manufacture it. We were not aware, that it would make blankets, of which (of foreign wool) there are twenty-five millions of pounds weight in daily use within our country. Its utility in girth webbing for military saddles, for belts of various kinds, for pantaloon, vest, jacket, trowser, frock, shirt, sheet, tent, knapsack, wagon, and sail cloths, twilled and untwilled, would ensure and cheapen that great mass of army and navy supplies, which have been made of ravens duck, drilling, sheeting, ticklenbergs, dowlas, girth webbing, and even sometimes of leather, as in the case of belts. If the military blanket, by land and sea, ought to be of wool, except in the hospitals and garrisons, still the manufacture of cotton blankets facilitates and insures the command of woollen blankets in time of war. For there could be no difficulty, in a war of virtuous and sound principle, to obtain from the private owners of three millions and one half of woollen blankets, now and always in use, the exchange of a sufficient quantity for the soldiers and mariners, to be paid for in new, clean and good cotton blankets, on fair terms.*

The charges on the exportation of cotton wool to Europe, and upon importing it in manufactures from thence, amount to 50, 55 and 60 per cent. on the sterling cost of blankets, common velvets and corduroys, cotton drilling, girth webbing, and other goods of constant and general consumption. It is evident and certain then, that our good house-wives, and cotton manufacturers, are protected by a difference of more than 50 per cent. in their favour. It is a similar difference, which has created and

* That this opinion is well grounded, will be inferred, when it is known that during the revolutionary war, the patriotic citizens of Philadelphia parted freely, and without a call of government, with their blankets for the use of our army destined to invade Canada. If then they voluntarily gave these articles, and without any equivalent,—at a time too when, from the existence of a war, the means of replacing them was cut off, and when the method of manufacturing them in the United States was scarcely known, it cannot be doubted that the present generation will freely exchange their used woollen for new cotton blankets, should the increasing rapacity of the European powers force us to appeal to arms to recover and perpetuate our rights.—EDITOR.

protected the coach-maker, the cabinet-maker, the gold and silver-smith, the paper-maker and stainer, the hatter, the plumber and the other manufacturers of *all* our hides, skins, flax, hemp, wool, and metals.

The various foreign invasions of our personal rights, and of our merchant vessels and ships of war, against all decorum, reason and justice, are powerful considerations in favour of every proper attention to the internal walks of our national industry. Our honest exertions, capital and skill, employed in the production of raw materials and subsistence for manufacturing families and their cattle, and in manufactures themselves, will give us *a great mass of certain, cheap and excellent supplies*, necessary in war, comfortable in peace, and profitable in both seasons.

GRAIN LIQUORS.

A FEW pages will be devoted to the exposition of the cane, fruit, and grain distilleries, and breweries of the United States: a great, important, increasing, and imperfect branch of American manufactures.

It is stated to Congress, in the report of the 17th of April, 1810, by the Secretary of the Treasury, that our grain and fruit distilleries made, so long ago as the year 1801, about nine millions of gallons of spirits. The distilleries from *foreign* molasses and coarse sugars produced, in addition, about three millions of gallons. The foreign spirits imported, in each of the years 1806 and 1807, when foreign molasses had failed, were nearly ten millions of gallons. Cider is made in very large quantities, and with great profit. We do not import this liquor. Our malt liquors are nearly equal to our consumption, for we import only 185,000 gallons, and the *cider* and beer exported under the proper names,* are 187,000 gallons, besides sea stores. Our breweries are a source of real, steady, and great profit. Foreign spirits are greatly advanced in price.†

* Beer is often shipt as "Merchandize."

† Windward Island rum in 1785, was sold at 42 cents, and is now worth 95 to 100 cents per gallon.

Two things then, appear within our power in the business of these common drinks: *first*, to improve the quality, and *secondly*, to increase the quantity. Apple orchards are known to be *very* profitable in the United States. By them we can increase, at pleasure, the good old farmer's manufacture—*American cider:* and we can furnish a raw material for the distillation of apple brandy, which when well made and ripened by keeping, is an excellent spirit. To these may be added peach orchards and pear orchards, for the manufactory of peach brandy and perry, or *pear cider.* These liquors are superior to the Spanish brandy and French rum, and to the Teneriffe, Fayal and other inferior wines.

Among the means of supporting the agriculture of this country, it is believed that there is none more sure, more easily practicable, nor more extensive, than the manufacturing out of our canes, orchards and grain, substitutes for the foreign beers, cider and spirits, and even for bad wines, which we import, and for the spirits made from imported molasses. The quantities of foreign spirits, at 10 millions of gallons; of beer at 185,000 gallons, and of spirits distilled from foreign sweets, may be safely computed at 14 millions of gallons. These being often of the high proofs, would require above six millions of bushels of grain to supply the distillers, (and much more would be required to make beer) who should be employed in manufacturing American spirits to substitute for foreign. This quantity of grain is greater than that, which would be required to make all the wheat flour we ever exported in a year. The nations, who scandalously injure our rights, would lose the supply of our flour, the sales of their spirits and molasses for distilling, and often the freight of both, and their navies and privateers would lose the opportunity to plunder our property. So far as the cane, our new and valuable acquisition, could supply coarse sugars and molasses, the Louisiana planters could reap the benefit. From the sugar plantations on the gulph of Mexico, to the orchards of the northern and eastern states, nearly all the American cultivators might share, at their own pleasure, in the supply of the raw materials, whether cider, or spirits, or beer should be chosen for the drink of the consumer.

The breweries of Europe afford us the sure and easy means

to extend our present stock of information, in that very useful art and trade. The domestic brewery, or *household* or family brewing, as practicable in our climate, appears to be worthy of the labours of the patriot and the chemist.

The grain distillery of Ireland is also peculiarly worthy of American attention. They generally distil there from *malted* grain; a practice little known and less pursued in the United States. The quality of spirits distilled from *malted* grain, and matured by care and time, is much superior to any idea, which is generally entertained by the native American consumers. Justly prejudiced against much of the harsh and new grain spirits of our country, called *whiskey*, all distilled liquors, made from our grain, are despised and disliked by many, without an attempt to introduce improvements from abroad, or those of age and rectification.

Important discoveries in the manufacture of spirits and beers have been made by American genius. The discovery of colonel Alexander Anderson, a native of Maryland, now of Philadelphia, in regard to the practicability of brewing with a considerable mixture of *unmalted* Indian corn; the discovery by the reverend Burgess Allison, lately of New Jersey, now of Philadelphia, of the mode of extracting the essential oils from spirits when burnt; and the discovery by the last gentleman of the practicability of profitable distillation from the common Indian *corn stalk*, may be found worthy of the attention of the enquiring artist, and farmer. The two first are certain advantages: the last is said to promise much, according to several early but imperfect experiments.

The vast consumption of inferior lowpriced foreign wines in this country, is worthy of considerable attention on this occasion. The wines imported into the United States are about two millions of gallons per annum. Some are reshipt. As before observed, perry, cider and peach brandy are far preferable to sharp and ill-flavored wines. The improvement and increase of all our liquors would have a tendency to diminish the use of those in a degree worthy of the attention of the cultivator, who raises materials for our distilleries, and of the manufacturers and capitalists, whose industry, skill, and money are employed in the business.

The household preparations of fruit liquors in many families, and even by distillers, from the fresh and dried peach, grape, currant, and cherry, are not unworthy of our attention, and particularly as it is probable they will lead to many useful experiments in the cultivation of the vine and the manufactory of its proper juice, in a country like this, whose southern regions produce the orange in as much perfection as Spain and Portugal, and whose more northern districts extend into the climates of the claret, the Sauterne, the Tokay, the Hock, the Burgundy, and the Champagne. All the climates of the vine, in Europe, are found in United America.

The most enormous expenses of the American revolutionary war, and the deepest sufferings of the patriotic army, were those produced by the frequent destitution of wine, distilled spirits, and porter. It is therefore of the greatest importance to our possible military operations, that there is already a quantity of some of these liquors, steadily manufactured in our country from our own materials, equal at least to ten millions of gallons. Let us then *improve the manufacture* on the principles of *good business*, free from the losses constantly produced by foreign spoliation, and from motives of public spirit, raised by foreign indignity, outrage and rapine.

It will not be useless, or impertinent to the public interest, to entreat the attention of the learned practitioners of *the healing art*, and other philosophers, to this subject. It is for them to inform us by what domestic *American* substitutes we can, in our various climates, most benefically exclude the poison of any particular foreign liquor. The *medicated* porter of Great-Britain, as our physicians can demonstrate, is far less wholesome than the pure extracts of hops and grain, which compose the whole tribe of *our* beers. Foreign liquors are often adulterated. The abundance of our ingredients of raw materials exempt us from the temptation to sophisticate the American drinks. A method to give a body to our *fermented* liquors, after the manner of the Madeira and Sherry wines, which will enable us to keep them sound in ullage casks and in uncorked bottles, is worthy of the consideration of the learned, able, and patriotic chemist.

HEMP.

EVERY movement of the belligerents is calculated to force the United States into the manufacture of their own supplies. The blockade of Elsineur and Sweden by the British government, the acts of the Danes, and of the Swedes in Pomerania, oblige us to find substitutes for the cordage, linens, steel, and iron, which we have heretofore drawn from the numerous ports of the Baltic. We have imported in a single year 6,500 tons of hemp, and 210 tons of cordage and cables, besides vast quantities of hempen drilling, sheeting, duck, and other linens. The mere unmanufactured hemp for these goods, at the present price of 400 dollars per ton, is worth in our markets two millions eight hundred thousand dollars, and weighs nearly fifteen millions of pounds. Our planters must supply the place, by American hemp, flax and cotton, of the sheetings, drillings, ravens duck, sail cloth, table cloths, and towels, which we procured from the Baltic. All those goods can be made also of flax; and they, as well as twine, cables, and cordage, can be well made of hemp. It will be our interest to cultivate more flax and hemp, and much less tobacco. A small quantity of this latter plant is consumed by our army and navy; but flax and hemp are necessary for the public supply, military and naval. The modification of our agriculture, so as to suit our own manufacturing purchasers, is necessary to the profit of our cultivators, and to the certainty and sufficiency of the public supplies on sea and land. The rich swamps in the eastern counties of North-Carolina and Virginia, and great quantities of the better class of lands in the western states, are well adapted to the production of hemp: and it is plain, that the linen manufacturers of middle and western Pennsylvania, and other places, could readily execute, by close imitations, linens like the best we receive from Russia. Twine, hempen yarns, white rope, and tarred cordage and cables, are extensively made on the Ohio and the Mississippi. All these sustain the expenses of transportation better than the less valuable raw materials of which they are made. The rival foreign articles sustain the transportation of the raw

material, by a long inland navigation to St. Petersburgh, in Russia: and hemp and flax, as well as linens, twine, yarn and cordage, are burdened with a heavy freight and insurance from that port to those of our country.

Steam engines can now be employed where mill-seats are wanting. Machinery to obviate the deficiency of hands is obtained. Capital has become abundant. Persons acquainted with every kind of manufacture are to be found in our country. Employment in foreign trades is so much reduced, that men of the best business, habits and talents, are at leisure to engage in manufactures. The more bulky is the native raw material, and the nearer to the place of its growth is the American manufacturer, the more sure and considerable is the profit.

As hemp and flax are universal productions of the United States, it cannot but happen, that the manufacture of them must be general, increasing, and, before long, very great. Ireland has lost, from various causes, much of her linen manufacture, and has not given us, for a long time, very large quantities of those kinds of linens, of which we are deprived by the blockades affecting the Baltic sound. There is therefore the greater necessity for us to make our own linen supplies, and especially those demanded by the army and navy.

The linens of Germany, (especially for coarse shirts, frocks, and trowsers,) with some from the Dutch and Flemish manufactories, have constituted our principal supplies for several years, particularly since the great agitations of Ireland, during the modern revolutions of France. All these German, Dutch and Flemish linens, are liable to interruption in their exportation, by the French exclusion of our vessels from the continent of Europe, and the British captures of our vessels in going and coming. These things must give a spring to the production of flax and hemp; and they must occasion American substitutes from those two raw materials and from cotton, to be made in our families and manufactories. The universal instruction of females in the art of weaving, as a domestic employment, would contribute greatly to such manufactures, and to the comfort and happiness of the sex. It should be a condition of all female's indentures, that the

girls should be taught to weave during their time of service. It can be easily effected in a few days, or in the evenings of a very few weeks. In many of the counties of England the women weave, as large numbers do in our eastern, northern and southern states. By this excellent practice the men are left for the duties of the farm, and other employments, requiring exposure and strength. If by water, horse and steam, we card and spin, and females weave, our manufactures will the better support the agriculture of the men. It may be safely assumed, that, if the women of our country, now unemployed in weaving, were to work in that way during one half of six days in the week, they would make enough of woollen, linen, and cotton cloths, and hosiery, to furnish our houses and clothe the inhabitants, including a war establishment of the army and navy. In this way may our American matrons and their daughters, contribute to correct the authors of the indignities and injuries, which we suffer from foreign violence and improbity. They would furnish the hammocks of the honest tars, who are to bear our thunders over the main, and the beds of the soldiers, who are to defend our shores, our altars, and our homes. It is impossible for us to foresee how soon our supplies may be cut off: how soon our means of paying for them, in our own produce, may be terminated: nor how soon a reluctant commitment in the outrageous contest of the old world, may require of us, that *all our men, and women too, should do their duty.* Let us then turn our agriculture, our business, our capitals, and our minds, in prudent timely anticipation, to the beneficial and necessary increase of manufactures, requisite to comfort and defence.

In considering the subject of hemp and flax and their manufactures, cut off from our markets by foreign violence and improbity, we are not to forget, that, if they amount to seven or eight thousand tons, our *surplus* cotton exported in one year, has been sixty-four millions of pounds, which exceeds 28,500 tons. Since the invention of the American cotton gin, by which the powers of agriculture in the southern states have been set loose, there is no limit to our capacity to bring cotton to market, but the demand for manufacture or exportation. Every year does

and will add to our list of goods made from cotton. In no branch will these goods be more frequent, more easy, or more useful, than in that which furnishes substitutes for goods of foreign hemp and flax. It is conceived, for example, that one fiftieth part of our ordinary cotton crop would make as much American twilled cotton drilling (in lieu of the hempen drilling, ravens duck and sheetings of Russia) as would furnish two summer suits for each man of an army of one hundred and fifty thousand men. Considering the redundance and steady increase of our cotton, and the numerous substitutes for foreign goods, which may be made of it, too frequent occasion cannot be taken to notice its applicability to old and new uses. When we remember, that cotton is much more easy and less costly to raise or procure than flax, hemp, wool, silk, or leather, we cannot doubt, that it will fall in price, till the cheapest cotton shall be as low as the cheapest of those materials. To increase our cotton manufactures, and either to duty or to banish those of the countries beyond the Cape of Good Hope, *which are never made of our cotton*, would obviously be to encourage and support the American agriculture. Upon the whole subject of this paper, as it relates to public supplies and those for private use, it behoves us ingeniously and deliberately to consider the most easy, prompt, effectual and profitable modes of procuring, through the means of our various raw materials, substitutes for the hemp and flax, and the hempen and flaxen goods, of which foreign cupidity and usurpation are likely to deprive us by orders and decrees, or captures and seizures. The illegitimate conduct of the belligerent powers has happily placed our manufactures, as it were, in a hot-bed.

The obvious tendency of the present systems of the belligerent powers is:—

1st. To decrease or rather to destroy the profits of the agriculture and land of the United States, by preventing the sales of our produce in some foreign countries, and by loading those sales with various heavy and debasing charges in other foreign countries.

2dly. To enhance the cost of American supplies by preventing their transportation hither from some countries, and by in-

creasing the charges, equally heavy and debasing, of the transportation from others.

The natural efforts of the American capitalists (both in land and in money) and of our manufacturers, and even of our circumscribed merchants, are to buy, raise and manufacture American produce and consumable articles.

No production of the United States has sustained a happier impulse than

WOOL.

THE fine cloths of England are advanced more than one hundred per cent. upon the prices of 1790. Those of France and Holland are prohibited by English usurpation, and those of Britain by French usurpation. The manufacture of cloth in Spain is destroyed or suspended. The Merino sheep are straying through the world, to us and all nations. In England they were sold in the year 1790, at the most excessive prices: even 800l. and 1000l. sterling, have been paid there for the use of a single breeder for *a single year*.* In America, they have been procurable on various terms, at the highest for less than a quarter of this sterling money for the full price of the finest ram, as the momentary, occasional and highest cost of the animal. The carding of wool has become an operation of the utmost facility, by water, cattle, or steam. The spinning is done by water, horse and steam. Steam engines have been introduced, improved and rendered familiar. The manufactory of cloths in private families has been much improved. Chemistry has thrown prodigious light on the art of dyeing in Europe and America. The stocking loom has been greatly improved, as also the dressing and fulling of stocking webs for hosiery, and for a new, curious, and excellent species of woollen cloth. The convulsions of Europe have driven hither every description of artist employed in the woollen manufactory. Sheepskins, formerly an offal, often left to rot, or only used to make glue, cannot now be procured in sufficient quantities for the skin-

* This refers to Bakewell, who let a ram of his breed for 12000 guineas, for one year.—EDITOR.

dressers, book-binders, wool card-makers and glovers—a great saving or rather profit to the sheep raiser, on whom the foundations of the woollen manufacture depend. The United States are intelligently bent upon the increase of sheep, as well the *heavy* fleeced sheep, as the *fine* fleeced sheep. Every kind of sheep is propagated, nursed, and spared to procure *fine* wool and *much* wool. The Merino and other breeds are secured, and cannot ever be lost. The mixture of our wool and our redundant cotton aids the clothing manufacture. The two branches work well together —a great and peculiar advantage in the clothing business of the United States. The women, as before observed, weave in many parts of America, and may be happily taught to weave in all the states. The increase of manufactures gives women full, safe and profitable employments, which formerly they had not. It is estimated by the Secretary of the Treasury, that our family manufactures exceed in value *forty* millions of dollars per annum, in the woollen, flaxen, and cotton branches alone. It is plain and certain then, that our army, navy and militia, in any possible war, could be supplied with clothing, far below the high costs of the late revolutionary war. The importance of our clothing manufactures is manifest and great. Their increase is rapid and incessant. The household branches alone, at forty millions, are worth double the value of all our exports at the adoption of our present blessed union and constitution. All our ordinary stock of wool is consumed in manufactures, and all we can procure by our import trade, and by all the foreign breeds of sheep. The great efforts of the farmers, *to procure wool*, do not keep pace with the increasing demand, though none is exported, and hence the prices of wool are kept up and for the best payments. Such are the new advantages of the American woollen manufacture. Shall we then continue to raise tobacco, to be dutied, plundered, rejected, restricted or excluded, according to their criminal will, by foreign governments, or shall we decrease it and raise more sheep, procure more and better wool, and provide a market at home, free from injury, insult and vexation, by the industry of our women and children, and the power of machinery, with a little aid from regular and skilful male manufacturers? Is it better to get from

45 to 150 cents per lb. for wool at a *sure* American market, or to raise tobacco to be plundered, dutied or driven from port to port, in distant seas? Let us consider *well* the past course, the present condition, and the apparent prospect of our cultivation and sales of tobacco, and all other productions. Let us consider, on principle, whether it is not better often to avoid articles of mere foreign consumption, the sales of which must be effected under all the disgrace and evils of these times on the ocean; and to raise or extract from the earth, wool, hemp, flax, cotton, leather, iron, copper, and lead, to arm, supply and clothe our soldiers, sailors, and militia, and to provide for the raiment of our families and the furniture of our houses. Let us observe well the state of Rhode-Island. With wool, flax, hemp, and leather of her own, she demands the iron and hemp of the Baltic and of her Southern sisters, for her manufacturers, and the cotton of Virginia, the Carolinas, Georgia, and the western states for her *pre-eminent* cotton mills. In that state there are already erected a number of cotton mills to card and spin, equal to one for every township, and her enterprising merchants and cotton millers have erected others in the adjacent townships of the more wealthy and populous states of Connecticut and Massachusetts. The native country of the illustrious Greene, has already made effectual provision for the sure and cheap supply of all the cotton goods, which can be necessary for any force of army, navy and militia, which we can want in any war: and this too, *in certain support of the Southern agriculture of the United States.* The population of the whole state of Rhode-Island is less than that of the English town of Manchester. Shall we cast the eye of fellowship and attachment upon our neighbour state, or upon our foreign rivals in British Lancashire, or Gallic Rouen? Shall we consume the provisions of the agricultural states by the cotton manufacturers in Rhode-Island and its vicinity, subject to the light expense of a coasting voyage, or shall we send them to Liverpool or Rouen, for foreign cotton spinners, under heavy charges and more intolerable indignities? Let us use the *home* market, since the roads to the foreign are blockaded, or subjected to a scandalous tribute.

SKINS.

THERE is no class of manufactures more important and necessary to the cheap and effectual supply of the public force in any possible war, than those, which are made from the hides and skins, of the farmer's animals, and from those of the beasts of the chace. Shoes, boots, guetres, stocks, cockades, straps, belts, scabbards, cartouch boxes, saddles, bridles, holsters, valaises, bags, caps, gunslings, harness and geers, leathern breeches, and even vests, ship pump leather, rigging hides, and some other articles, are made in the best forms by our various leather manufacturers of American and foreign hides and skins, tanned, tawed, coloured, or in the hair, as the case requires. To these may be added, for general use, trunks, portmanteaus, saddle bags, carriage boots and tops, gloves, pocket-books and portfolios, card-faces, book covers, parchment, sham-morocco, and many other things to a great amount. It is stated in the report of the Secretary of the Treasury, that all our leathern manufactures may be estimated to be worth per annum twenty millions of dollars---a very moderate estimation. Those of England are computed at more than ten millions sterling, or forty-four millions of dollars. A large part of the difference is occasioned by the cheapness of the American skins, leather and manufactures. In proportion to our population, the quantity of the leather goods in America is not materially less than that of Great-Britain, in all the necessary and useful kinds. This great value of American manufactures from hides and skins is highly useful to the country, in public and private supplies, and it is very beneficial to the landholders and cultivators in the sure and steady market it affords for skins, lime, bark, building materials, draught cattle, and the food of the men and beasts employed in the business. We do not stand in need of any foreign purchasers for our skins: nor for our bark and lime, so far as the leather branch demands them. In every instance, the American manufacturers support the American farmers, by purchasing the skins of their sheep, hogs, horses and horned cattle. These skins are converted, as we have observed, into shoes,

boots, saddles, shiphides, and other necessaries and requisites for the comfort and service of the defenders of our country, by land and sea. A copious, sure, and excellent mass of *war supplies* is thus secured for ever to our country, and this too, at the expense of those foreign nations, who formerly furnished them, and who have intrenched upon our personal and public rights and interests on the high seas. Those who in a phrenzy of avarice, have *temporarily* suspended our commerce, have, by that very measure, *permanently* established our *adult* manufactures. Our leathern manufactures alone, are at this moment worth much more per annum than were all our exports in the first year under our present national constitution. Peace in Europe will restore our commerce, but nothing can deprive us of our established manufactures. They have passed the infantine state. They are now *adult*. They have grown naturally and unforced, out of our own lands, our own waters, our own woods, and our own wants. The presence of those raw materials, which cultivation, fishing, hunting, mining, or our various soils spontaneously produced, have occasioned the manufacture of those plain, good and useful commodities, which are necessary to righteous defence, and to the wants and comforts of civilized man.

In regard to the leathern branch, it may be useful particularly to suggest to the citizens of our western states and territories, of Pittsburgh, Erie, and the towns on the Ontario, that they owe to their country and themselves more reflection and exertion on the subject of the skins of all the wild animals. The deer skin, for example, often perishes in its way from the western forests to the Atlantic warehouses; and frequently, nay generally sustains an expense of transportation too heavy for its low *unmanufactured* value. Every mode therefore of preparing, dressing and employing deer skins in our western and remote settlements, should be carefully devised, considered and executed. They are susceptible of being well tanned. Lime, bark, and tanner's streams, with cheap grounds, present themselves in abundance in all the villages, townships, and counties adjacent to the Indian country. Well prepared deer skins, tanned, tawed, and buffed, or in russet, or in black, are fit for many common purposes, and for military

supply. Very large quantities are sent, dried only in the hair, at a ruinous expense of transportation, from our remotest wilds to the distant manufactories of transatlantic Europe. This subject is worthy of the utmost attention of the Indian trader, and of the Western merchant; of the manufacturers of leather, and of their monied friends in our frontier states and districts. Any considerable improvement, in regard to the manufacture and employment of deer skins, would be of great importance to the supply of *military* leather, and of course *to the operations and maintenance of our army* in our young settlements, and in the scenes adjacent, in any possible Indian war.

The more general preservation and dressing of the skins of hogs, (the best leather for the seats of military saddles) would be attended with good effects upon our public and private supplies. In the Eastern states more of the due attention is paid to this object; but it is really neglected in some intelligent and economical quarters. Since the usual supplies of foreign hides and skins is not at present received, and since war might interrupt their importation, the beneficial consequences of present attention to the skins of hogs, of deer and other animals, now in some measure neglected, merit consideration, as it would give comfort and effect to our forces, and economy to our military expenditures. The enhancement of the price, value or demand for all Indian skins, would render our intercourse with them more profitable, and of course, more inducive of peace. Our rival neighbours cannot employ the savage hunter's furs and skins, in manufactures and consumption, on this side of the Atlantic. They cannot, therefore, in this respect, as well as the Americans, tempt our red neighbours into the paths of friendship, by the benefits of trade. Thus we perceive, that while our unforced and naturally growing manufactures give us cheap and sure military supplies, with a view to our white rivals and foes, they diminish our occasion for those costly objects in respect to the conciliated Indians. It is well, in the hour of necessity, to be able to procure cheap supplies; but it is better thus to remain in peace with our savage neighbours, and, in consequence, to be exempted from the burden of the purchase.

When any branch of American manufactures has obtained maturity, elegance and beauty, as is really the case of our leathern commodities, open and covert exportations naturally take place. Our rivals, in the field of trade and manufactures, bring upon themselves the great new evil of our powerful competition. In most useful things of leather, for example, in the South American markets, we can by price and quality effectually supplant the European manufacturers, especially since the foreign orders and decrees have driven our monied capitals from our ships to our workshops. So Britain may furnish them for a time with the lighter cottons, for the luxurious and the fashionable few, but we shall supply them with the heavy and substantial commodities, required by their plainer and their poorer millions.

IRON AND LEAD.

The progress of our iron manufactures has been so great, that to the productions of our mines, furnaces, and forges, the predatory character and conduct of most of the foreign navies is no injury. The home market, which our artizans create for unmanufactured iron, enables the landholder and iron master to look, with commisseration or contempt, upon the scandalous naval degraders of the regular governments of Europe.

But the benefits resulting from our iron manufactures do not stop here. Regular and approved *fire arms* are annually made in the United States to an amount sufficient to equip an army three times as large as the greatest, which Britain had on this continent in the war of the revolution. Besides these, many rifles, pistols and swords are manufactured, and many cannon, shells and balls are cast at our foundaries. The aggregate of our iron wares is estimated, in the treasury report, at 15 millions. Thus it is, that manufactures afford at once a sure and great supporting market for the spontaneous metalic productions of the earth, and provide us with the best instruments to defend our much injured rights. Will any faithful and considerate American consent to destroy these precious military manufactures, the want of which was so solemnly felt in the year 1775? Will he strike this im-

mense and precious item of 15 millions out of the account of our warlike resources?

In like manner, the discovery of lead mines, and the purchase of Louisiana, have given us a very considerable quantity of that convenient and necessary metal: it is not all nearly sufficient to supply the home market suddenly created by our own manufacturers of that material. Thus again do our numerous artizans exempt us from the necessity of sending our lead, *through injuries and insults*, to European markets, furnishing us at the same time with every description of the leaden means of public defence.

In this manner also, the manufacturers of copper, zink, brass, and pewter, minister to our prosperity, and to the safety of our country.

The endless variety of our metalic manufactures, directly or indirectly for the use of the army, the navy, the militia, the hospitals and the laboratories, is well known to every man of information in the United States. We have arrived at such a point of skill, that it may be correctly affirmed, that there is scarcely a metalic requisite or convenience, which our workmen could not make, at no extravagant price. Many of these things are lower than the cost and charges of importation, and others are cheaper than their prices in Europe. Of this class is a long and valuable list of hollow wares, the shapes of which subject them to accidents and to an insupportable freight. So great and so sure is the market for American metals, created by our manufacturers, and so immense is the mass of their supplies *for the public service*, and for individuals, that they require the importation of at least ten thousand tons of foreign iron, steel, copper, zink, tin, lead, brass and pewter in every year. The trip or tilt hammer, the rolling, slitting, boring, grinding and polishing mill, and the nail manufactory, and several others, proceeding by water, horse or steam, are means of exempting agriculture from the loss of its labourers, which the docile artists of the United States have learned, from Europe or their own mechanicians, diligently to employ. The little Naiades, and not Hercules, are put, in these curious times, not only to the distaff, but to the powerful roller and the ponderous sledge.

Let it be well remembered then, that the numerous host of metal manufacturers in the United States, not only consume the whole production of our various mines, in preparing for us every description of useful and necessary commodity to which metals are convertible, but that they demand, through our merchants, from the landed interest of foreign countries ten thousand tons of metals. Be it then the steady and active endeavour of the American land-holder to supply their wants, and to supplant this rivalship of distant nations. Manufactures, at least when unforced, if rightly understood, enable united America to be more prosperous in peace and *much more secure in war*. The awful want of military supplies, which marked the revolutionary contest, is no more. The manufacturers of America, working on the spontaneous productions of our own soil, or on the fruits of its cultivation, and sometimes also on the imports of the enterprising merchant, have terminated for ever all the evils of a scanty, dear, and precarious military supply.

WOOD.

THERE is no branch of American manufactures more interesting to agriculture and to the public defence, than that of the workers on *wood*. It is computed at twenty millions of dollars per annum by the Secretary of the Treasury, and, as it is believed, without the smallest exaggeration. The list of *military* manufactures of wood is long and important. Some of them are as follow: The hulls, masts, spars, blocks, anchor stocks, boats, &c. of public and private vessels of war; oars and sweeps; handspikes; gun-carriages and waggons; tomkins; pistol and gun-stocks; sword-handles; blocks of cartouch boxes; canteens; budge-barrels; jackscrew stocks; grape-shot stocks; packing, liquor and water casks; mill work for military manufactures, &c.&c.

On the important manufactures of *wood* depends in a degree the whole business of the clearing and cultivation of the earth by ploughs, hoes, spades, shovels, axes, rakes, forks, scythes, sickles, &c. which are all stocked or handled with wood. The whole business of transportation within the country by boats, shallops,

and carriages; and the whole business of the conveyance of our produce and our supplies to and from the several states and foreign markets, also depend on our manufactures of wood. Without this class of manufactures then, our lands would remain in a state of nature, our grain would be unreaped, unfanned, uncleaned, unground, unpacked, and unmoved from our farms to our grain ports, and from thence to our other ports, or those of foreign nations. So of our other crops. Our vast manufacture of pot and pearl ashes, so important to our own arts and trades, and so valuable an article of our exports, belong to the wood branch. Our packing casks, cases and boxes for dry and liquid commodities, and our workmen's vats amount to millions in number; and without these agriculture would languish. Even the produce of foreign countries is brought to us in boxes and casks made out of our own boards, heading, staves and hoops. Not only the handles of all the instruments of husbandry, defence and navigation, are made by ourselves of wood, but those of the tools and implements of the useful and necessary arts and manufactures. A vast proportion of the wood and timber is the growth of our own lands. We are not willing to depend for gunstocks, sword-handles, carriage blocks, gun-carriages, privateers and ships of war, on foreign manufactures and transatlantic forests. We are rather disposed to embrace, as all important to the prosperity of the land-holder and the public defence, our ship builders, carriage makers, mill-wrights, saw millers, carpenters, wood turners, coopers and gun-stockers.

RECAPITULATION.

Such then is the actual condition of the manufactures of the United States, which are made of the principal productions of our land and labour.

The sketches, which have been submitted to the public consideration in these papers, may serve to manifest the real and growing importance of *the American manufacturing purchasers* to the landed interest, and to the supplies of the army, the navy, the militia, and the public and private ships of war. It may be use-

ful here to offer a recapitulation of our manufactures, as they have been estimated by Mr. Gallatin, in his official report of the 17th of April, 1810.

They are as follow :—

Manufactures of wood, as the material - -	$ 20,000,000
do. of leather, as ditto - - - - -	20,000,000
do. of soap and tallow candles - - - -	8,000,000
do. of Spermaceti oil and candles - - -	300,000
do. of refined sugar - - - - -	1,000,000
do. of household manufactures of cotton, flax and wool	40,000,000
do. of fur and wool hats - - - -	10,000,000
do. of spirituous and malt liquors exclusive of cider	10,000,000
do. of iron 15,000,000 to - - - -	12,000,000
	$ 121,300,000

do. of paper, paste-boards, printing and book binding.
do. of hemp.
do. of cotton, wool and flax, not made in families.
do. of seeds, oils and glue.
do. of copper, brass and pewter.
do. of lead, including painter's colours.
do. of tin, japanned and plated wares.
do. of gunpowder.
do. of starch, hair powder and wafers.
do. of earthen ware and glass.
do. of salt and refined salt petre.
do. of chemical preparations.
do. of straw and chip bonnets and hats.
do. of calicoes printed, &c. &c.

The value of these is not estimated, but is undoubtedly very considerable.

When it is remembered, that in the first year of our present beneficial and inestimable union, under the existing constitution of the United States, we did not export foreign and domestic

merchandize to the amount of 20 millions of dollars, we cannot but rejoice in so grand an exhibition of American manufactures, as is above stated. If the fourteen items not carried out, could have been correctly estimated and added to the nine preceding, our whole exports, in the most favourable year, would appear very far inferior. Those exports are fluctuating, and much too dependant upon foreign justice and friendship. It is a part of the object of these papers respectfully to demonstrate, that our *actual* advance to a manufacturing system of 120 to 150 millions of dollars, has given us *a great and sure home market* for the greater part of our produce, exempting our crops from foreign plunder and an odious taxation; and a copious source of military and private supplies, free from spoliation and a scandalous tribute.

Having thus rapidly advanced in the business of American manufactures, *and being in real want of raw materials for every branch* except that of cotton, it is plainly our interest to pursue, as Rhode-Island has done, the cotton manufacture, to lessen the cultivation of tobacco, and perhaps of cotton, to raise madder, woad, and other dye-stuffs, and more wool, flax and hemp, and to draw forth our coal, clays, lead, iron, copper, tin and zinc, from the teeming earth. In the six years of sickly and inert peace, which preceded the auspicious birth of our present federal system, we imported soap and candles, cables and cordage, refined sugar, much of the most simple and necessary leather manufactures, hats, beer, ale and porter, cider and perry, wares of the common and precious metals, cabinet work, carriages, implements of husbandry, nails and spikes, and various other articles, which have either vanished from the list of our imports, or have been greatly diminished, in proportion to our consumption. The duties imposed for the public revenue and service, the freight, insurance, commissions, and other charges of exportation from Europe, and of importation here, have yielded, in effect, *a sure and substantial protection* to the American manufacturers. As to all the states north of the *cotton country* of United America, this real, very great, and indefeasible protecting advantage has occasioned *all* their raw materials to be manufactured within ourselves. This is clearly proved by our large im-

portations of iron* and steel, lead,* copper, zinc, block tin, pewter, brass, flax, hemp,* hides and skins, madder, and all the wool we can procure. Not only do the middle and northern sections of the United States manufacture *all their own raw materials*, but they have so fully entered into the domestic and mill manufactory of our southern and western cotton, that almost every retail store in the ten middle and northern or eastern states, effects, in every year, *more sales of cotton than of wool, flax and hemp*, and the state and vicinity of Rhode-Island exhibit a water spinning cotton mill, in or for every township. The presence then, of this *only redundant* American and southern raw material, has produced these pleasing and successful exertions in this interesting manufacture, amounting already to one third of the whole value of the foreign manufactures imported into the United States, in the first year of the present constitution; though the district, which includes these eastern cotton mills, does not exceed a little oblong of sixty miles by forty at the utmost. The population of that leading district of the cotton water mills, is not one thirtieth part of the ten middle and northern states. The present stable footing of our cotton manufacture, and its rapid progress in profit and perfection, cannot be doubted. The deep interest of the *southern* cultivators in our extensive and diversified manufacturing operations has become manifest. The vast and certain aid of those operations to public, military, and naval supply, are equally obvious, and incomparably more important, even in times of peace. But incalculable is their value in this solemn crisis of human affairs, when all the sons of Columbia are admonished, by the armament of every other nation, to adorn their houses and fill their magazines with conveniencies and necessaries, *for the sudden and effectual exertion of the whole public force, in defence of our altars and our homes.*

* Of iron and steel,	£.22,000,00
Of lead,	5,500,000
And of hemp and flax,	15,000,000
Are imported, being	£.42,500,000

ON THE UTILITY OF

THERMOMETRICAL OBSERVATIONS AT SEA.

THE subject of the importance of an accurate knowledge of the temperature of the water at sea, to navigators, was discussed by the Editor in another publication:* an extract from the work by Col. Williams, was there given, with some original facts, to confirm his theory, and to shew the advantages which had actually resulted from an attendance to it: notice was also taken of the loss that had recently happened of the Lady Hobart packet, in July, 1803, by running against an island of ice. The facts detailed by Mr. Masson are very pointed, and ought to dispel any doubts in the minds of those who could hesitate assenting to the truth of the theory of Col. W. Science has seldom been applied more beneficially to forwarding the business of mankind, than in the present instance, and every navigator ought to be under lasting obligations to Col. Williams, for the knowledge of the means of securing their safety at times when the compass, the log, or the quadrant, nay, their organs of vision, avail them nothing.—EDITOR.

Extract of a letter from Francis D. Masson, *Esq. to Col.* Jonathan Williams, *Commandant of the corps of Engineers, and Author of* "Thermometrical Navigation," *at New-York, dated*

"CLIFTON, *(Eng.) 20th June*, 1810.

"MY voyage from New-York to Halifax, in the British Packet Eliza, was so very tempestuous and unfortunate (having carried away our foremast,) that I did not make any thermometrical observations; but when we sailed from Halifax, on the 27th of April, I began them, and continued till I unfortunately broke both my Thermometers. However short the time was, you will perceive that my observations have been very important, and I herewith send the result of them. You will perceive with what fidelity the Thermometer indicated the Banks, and the approximation towards Islands of Ice. The Captain was so convinced of the usefulness of the Thermometer, that he made regular remarks, and inserted them in his journal. I gave him one of your books, thinking it would be pleasing to you that I should extend the knowledge of a discovery so useful as yours, and I wish it were more generally known. After having miraculously escaped the Islands of Ice and several severe gales, we arrived at Falmouth on the 22d of May, 1810."

* Dom. Ency. article Thermometer.

A THERMOMETRICAL JOURNAL

FROM HALIFAX TOWARDS FALMOUTH, IN THE BRITISH PACKET ELIZA.

Dates.	Hours. A.M.	Hours. P.M.	Heat of Air.	Heat of Wa.	Latitude N.	Longitude W.	Remarks.
April 28	10		44°	40°			
		1	47	41	43° 30′	62° 52′	
		4	43	42			Sable Bank.
		8	46	40			
29	8		45	43			
	Noon		49	48	42 27	60 54	
		5	50	62			
		7	48	64			
		10	48	54			Tacking tow'ds edge of stream
30	9		58	62			Steering in the stream.
	Noon		60	61	42 1	59 21	
		5	58	61			
		9	60	60			
May 1	8		60	58			
	11		60	46			Sound in 70 fat. no bottom; the water at that depth 2 deg. warmer than at the surface.
		2	64	52	41 53	56 52	
		3	62	46			An Island of Ice, bearing S. S. E. 7 miles.
		4	58	47			Abreast of ice 1-4 mile to leeward.
		5	60	47			
		6	57	45			Island of Ice bearing S.S.W. 7 miles.
		8	56	43			
2	1		58	50			
	3		60	60			
	8		60	62			
	10		63	63			
	Noon		64	63	41 25	53 8	
		3	61	64			
		6	62	58			Sound with 70 fath. no bottom.
		9	56	56			
		12	50	56			Sound with 80 fath. no bottom.
3	4		43	43			Sound with 80 fath. no bottom.
	6		40	39			An Island of Ice abreast 100 yds. This was about 150 ft. high. and 1 mile in diameter. When first discovered, it was not 100 yds. from the vessel, and we were sailing directly towards it. The obscurity was then so great, that at that distance it appeared only like a white cloud extending from the sea over our masts.
	8		41	44			Passed several Islands of Ice, the largest bearing S. W. 7 miles.
	10		43	45			
	Noon		44	43	42 1	50 4	No bottom by 80 fathoms.
		4	44	50			
		6	46	60			
	Midn't.	12	46	60			
4	4		46	52			
	8		43	60			
	Noon		55	59	42 54	46 2	
		3	49	50			
		12	48	60			
5	6		47	59			
	Noon		53	59	43 12	41 43	Broke the Thermometer.

REMARKS ON THE FOREGOING JOURNAL.

N. B. THE important point of comparison, is the difference in the *heat of the water in different places*, in or near the stream, in the ocean, out of the stream, on the coast, and near Islands of Ice; not the difference between *the heat of the water and the air*, as some have imagined. This latter is merely a concurrent observation; it serves to account for ordinary changes, and thereby to guide the judgment.

From April 28, at 10 A. M. to April 29, at 8 A. M. we see the temperature of the sea in the shoals of Sable, from 40 to 43. At 5 P. M. we see the warm influence of the Gulph Stream from 62° to 64°. At 10 P. M. we see the temperature between the influence of the stream in deep water, and the coast, at 54°, which is about a mean between the two—then standing off shore, at 9 the next morning (30th) we see the warm influence of the stream again.

If these stripes of water had been distinguished by the colors of white, red and blue, could they be more distinctly discoverable than they are by the constant use of the Thermometer?

About 23 hours afterwards (May 1, at 8 A. M.) we find the water cooling, and in 3 hours more the mercury falls 14 degrees (46°.) Here no bottom could be found by the lead, and there was probably an Island of Ice obscured by fog. (Let it be remembered, that the coldness of ice condenses the atmosphere, and of course the consequence must be fog.) Passing this at 2 P. M. the Thermometer rose to 54°, but in one hour more it fell to 46 again, and an Island of Ice appeared at the distance of *seven miles*. Let navigators reflect on this, and say that a sudden fall of 6° in this part of the ocean, ought to induce them to haul to the southward, and keep a good look out. From May 1, at 11 A. M. we see the gradual changes as the ship passes the ice and comes again into ocean water (50°); but in two hours more, the ship is in the warm influence of the stream again, and the mercury rises 10 degrees (60°.) She proceeds in a nearly regular degree of heat during 17 hours, till at 6 P. M. the water begins

again to cool, falling to 56° at midnight. Here was no bottom in 80 fathoms. May 3d, at 4 P. M. the water was at 43°, still no bottom in 80 fathoms. Now, from past experience, we must say, here is an Island of Ice in a *less* distance than *seven miles*, because at that distance the water was at 46°. When day appears, behold an enormous Island of Ice abreast 100 yards, and the heat of the water reduced to 39°! A question now occurs,—Had not the Thermometer been thus used, had it not been continued during the night, what would have been the fate of this ship?—Let the recollection of the miserable fate of the ship Jupiter, be an impressive answer; and let it be laid down as a maritime axiom, that want of caution, or ignorance, can alone cause such accidents in future.

JONA. WILLIAMS.

ON COCHINEAL.

By EDWARD CUTBUSH, M. D. *Philadelphia.*

THE colouring of cloth and other articles of dress, is not in itself an object of necessity; but custom having introduced the use of clothing of various tints, from the *plain drab* to the *Tyrian purple*, it becomes important to the manufacturer and dyer, to procure their colouring matters with facility, and at a moderate price. As the *cochineal* insect furnishes a colour, which is frequently used by dyers, either alone or combined with other articles, it may not be improper to call the attention of the planters of the southern states, to the propagation of the insect, and the cultivation of the plant on which it feeds, and from which it derives its importance in commerce. By attention, a sufficient quantity of this article might be propagated in many parts of the Louisiana Territory, South-Carolina and Georgia, to supply the immediate wants of the manufacturers in the middle and eastern states; and, in the course of a few years, it would become an

important article of exportation to foreign markets. The Spaniards, until a few years since, enjoyed, almost exclusively, this lucrative branch of trade, when the attention of the English East-India Company was attracted by Dr. Anderson, physician-general at Madras, who conceived that he had discovered the true *cochineal insect* in the environs of that place, which, however, on being sent to London, and submitted to the test of experiment by Sir Joseph Banks, proved to be very different from the Spanish grain. Dr. A. being disappointed in his expectations, by perseverance succeeded in procuring the Coccus Cacti (Cochineal insect) from South-America, with the favourite plant on which it feeds, (being the Opuntia, Nopal, or prickly Pear, the fruit of which is a beautiful crimson) and established a Nopalry at the expense of the Company, where the insects were propagated with success for several years.* It is astonishing that these little insects should have been the source of so much speculation and jealousy, on the part of the Spaniards, as to induce them to keep their propagation and culture a secret for 260 years, and to have amused the learned world with the description of the Silvester for the genuine Cochineal. In 1736 no less a quantity than 880,000 lbs. were imported into Europe; and the imports into Great-Britain alone, during the years 1783, 4, 5, and 6, amounted to 1,154,590 lbs.; the presumption is, that the quantity annually increases; it therefore becomes an object worthy the attention of our southern brethren. Europe has paid to Spanish America upwards of half a million sterling per annum for this article; which, in point of value, *in some places*, has been considered next in rank to gold and silver. A wild species of this insect is found in several parts of South-America, which is called Silvester, but the *Spaniards* and *Mexicans* only, are said to have the true cultivated species, which yields the fine colour so much admired; this is owing, in all probability, to a selection having been made of Opuntia for their Nopalries, which yields fruit of a crimson colour: perhaps, if the Silvester or wild spe-

* Monsieur Thiery de Menonville also propagated them with success in the French Colony of St. Domingo, previous to the year 1780.

cies of insect, were confined to this species of Opuntia for their subsistence, their colour would equal that of the cultivated or grana fina; this, however, is merely my conjecture.*

There are many species of Cacti usually described by botanical writers; that which bears the name of Cactus Cochinilifer should be selected for a Nopalry. "Of the Opuntia or prickly Pear," says Wynne, "there are different species in EAST-FLORIDA; *on one sort, with a smooth leaf, the Cochineal is found in incredible plenty;* of the *fruit* of the other species is made a vegetable Cochineal, which may be used for ordinary purposes instead of the true Cochineal."† In Mexico these insects are nursed with great care. The Coccus *naturally* fixes on the leaves and stems of various plants. The Indians gather them, put ten or twelve into little beds made of moss or the flue of Coco; after which, they *hang* them upon the thorns of the plant known under the various names of Raquette, Cardassia, Indian Fig-tree, Opuntia, and Nopals: great quantities of this plant are cultivated in the vicinity of their habitations. The insect gives birth to myriads of young ones; they disperse, feed on the juice of the plant, and there produce a fresh generation. When they have attained their full size, they are taken off by *scraping* the leaf; this is not so fine a quality as that which is taken off by means of pincers, because a small quantity of the epiderm of the leaf is blended with it. The Spaniards call it Granilla. As soon as the insects are collected, they are destroyed and dried. The method taken to effect this has a great influence on the colour and value. That which they kill by the gentle heat of ovens

* It appears that I am incorrect. It is asserted in the "Circle des Philadelphes," and on the basis of *experience*, that the red, yellow, violet, or white colour of the fruit of the Cactus or Nopal, produces no difference in the colour of the Cochineal, which are nourished upon these several species, neither do they yield more nourishment. If this information be correct, I do not see the necessity of being so particular as to the choice of those plants, intended for a Nopalry, which is inculcated in the Society's publication, entitled "Traité de la Culture du Nopal, et de l'education de la Cochenelle. St. Domingo, 1787." In this work they recommend the Nopals for the fine Cochineal, and the Spanish Raquettes and Opuntia for the Silvester.

† Wynne's Hist. of North-America, Vol. 2. p. 334.

is of an ash gray or mottled, and is called Jaspeada. If killed by plunging them, in baskets, into hot water, they are called Renegrida; these are not covered with a white powder. That which bears the name of Nigra, has been killed on hot plates. The Cochineal, *nursed upon cultivated plants*, yields a more beautiful colour, and in greater quantity than the wild.* The Cochineal, dried on tin or iron plates, *by the heat of the sun*, is by far the best in quality. That which is killed by hot water, is deprived of part of the colouring matter.

OF THE NOPALS.

THERE are two species of Opuntia, which they call Nopals in Mexico; one is that which the Indians name simply Nopal; the other is called *Nopal of Castile*. The Nopal is a species of Cactus, whose articulations are compressed; its roots are of a gray, ash colour, inclining to yellow; they become ligneous by age: they always have a perpendicular or tap-root; others horizontal; they are round, and, in the young plants, tender; in the old, ligneous. The trunk of the Nopal grows in the form of a tree, like the generality of Opuntia; the articulations are of an oblong oval; they are from ten to eighteen inches long, by five or nine broad, and about an inch and a half thick. When the plant has developed itself, the rind of the articulations presents a smooth surface to the touch, very lightly and finely tufted on those of six months or a year old. It is of a dark green in the adult state, and a light, glossy green when young. The young sprouts are armed with one, two or three thorns, one of which is greater than the second, and the second larger than the third, when there are three; where there are two only, one is always taller than the other; their thorns are an inch or more in length, ligneous, solid, and very sharp. This distinguishes them from the Opuntia without thorns, such as those of Campeachy, the Spanish Raquette, and the Nopal of Castile; these, however, are not absolutely without thorns, but the quantity is less and more minute. These thorns are always greater, more numerous and strong on

* Vid. Barbut, sur les genres des Insectes de Linne.

the old trunks and branches; such, for instance, as have arrived to the age of two or three years. We rarely see more than one or two short thorns on the young joints; frequently there are none. The young sprouts, like all the other species of Opuntia, are always furnished with bundles of reddish bristles.

THE NOPAL OF CASTILE.

ALL that we have said on the Nopal, respecting the bristles and thorns, may be equally applied to the Nopal of Castile. Its roots and colour are the same; like it, its form is arborescent, but *differs essentially in the trunk*. The articulations are larger, being thirty inches long by twelve or fifteen broad, and have, like the raquette, the round form of the summit, resembling very much the leaves of purslain; they are of a vert d'eau, very clear and gay; this colour is a species of damask, like that of the dark red prunes; the finger removes it, on touching the articulations which are from six months to a year old, but not from the aged. The appearance of the plant is splendid. No one can describe, much less paint the liveliness and magnificence of the vegetation; the abundance, the grandeur, and the developement of its articulations; in a word, we know it to be the most beautiful of the Opuntia class. This species of Nopal does not come from Castile, as its name imports, but has been thus named for its beauty, and as a compliment to the Castilians. It appears that the Indians of Mexico cultivate this plant, more for the fruit, than for the subsistence of the cochineal insect.

The true and most essential property of the Nopal, known in Mexico, is to nourish the fine Cochineal, with more certainty, and more abundantly, than any other species of Opuntia. Is it the facility with which the young insects fasten their feet to the *velvet surface* of the rind of the true Nopal, which gives it the preference over that species of Opuntia, whose articulations are polished? After all that has been said and written respecting this species of Opuntia, an author now before me observes, "Après six expériences consecutives, qu'il n'y a point de difference entre

la récolte de la Cochenille sur cette espèce à celle faite sur le Nopal."

There are different accounts given of the colour of the flowers of the Nopal of Castile; whilst some say that the flowers are of a blood-red, others assert that they are purple; but I believe that it is very generally acknowledged, that the juice of the fruit is red. The fruit, when eaten, colours the urine of a high crimson: to persons unacquainted with this effect, much anxiety has been produced, conceiving that they were attacked by some fatal disease. It produces no injury to the urinary system; its effects cease in twenty-four hours.

NOPALRY.

A PLOT of ground set apart for the cultivation of the Opuntia or Nopal, is called a *Nopalry*. A Nopalry of one acre, or one and a half, is sufficiently extensive to occupy the attention of one man, during six months of the year. The ground selected for a Nopalry should be dry, and so situated, as to enjoy all the benefit of the sun's rays, and be sheltered from the most violent winds which prevail where it is established.* It should be surrounded by a wall, hedge, or fence. In the preparation of a Nopalry at Madras, Dr. Anderson recommended a piece of ground having a southern exposure, containing about two acres, which he directed to be levelled and enclosed by a bank of earth, ten feet wide at the base, three feet high, and four feet wide at the summit, leaving a slope on each side to resist heavy rains. On the top of this bank, he directed a hedge of the "Milk Hedge," (Euphorbia Aphylla); at the foot of the bank, on the inside, a ditch to be dug two feet wide, with an outlet, to prevent the ground from being overflowed. The ground, being thus prepared, was planted with Nopals about six feet apart. That species of Nopal is recommended, which is of a slender structure, with thorns so small as only to be seen by the help of a magnifying glass, as the most

* It is unnecessary to direct that the boundary of a Nopalry should be in this or that situation; regard should be had to the climate and situation of the piece of ground, which is intended for the Nopalry.

proper for the treatment of the Cochineal. Thiery de Menonville describes it under the name of the Nopal of Castile. Cuttings of the Nopal, containing *two articulations*, may be planted at a *convenient distance* apart, and intersected by walks to permit a person to go round the plants to examine the state of the insects. When the Indians of Guaxaca plant a Nopalry near their dwellings, they generally place in each fosse two plants, and sometimes three, each composed of two joints, that the Nopalry may be quickly prepared, and that one may supply the place of the other, in case of accidents; when they have taken root, the superfluous plants are plucked up. The Nopalry should be preserved free from weeds and grass, otherwise many insects will be lost. Should the situation of the Nopalry render it hazardous to expose the stock during the winter, it would be proper to have a *conservatory*, which should be kept moderately warm, and supplied with a sufficient quantity of the Nopals, planted in boxes or pots, for the subsistence of *a few insects* for a summer brood: this would form a convenient nursery. It is recommended to examine those insects which are about *seven weeks* old; those that appear the most forward in their gravid state should be collected, and put into bags made of pieces of thin gauze or hair cloth, of a texture sufficiently close to confine the mothers, and at the same time, room should be left to permit the young ones to escape, through the interstices, to form a new colony. These bags should be attached to the plants; or some branches, on which the young Cochineal insects are beginning to issue from their mothers, may be cut off and placed so near to a fresh plant, that the young ones may creep with ease from the branch to the plant. The young of the Cochineal insects are liable to be attacked by several species of insects, which frequently desolate whole plantations: perhaps this is the reason why Dr. Anderson recommended the hedge of Euphorbia, which is said to prevent these destroyers from entering the Nopalry.

The parade which some writers have made in their directions for the planting of the Nopals, "at an obtuse angle with the *west*," and "*acute angle with the east*," in "diagonal lines to the south," &c. gives an air of mystery to the culture of the

Nopal, which has a tendency to prevent farmers from engaging in the propagation, of the insect. Every person, who has witnessed the growth of the various species of the Opuntia amongst the rubbish in the vicinity of towns in warm climates, must be convinced that the plant does not require so much attention. The Nopals, however, are subject to disease; but neither their diseases, enemies, nor accidents, can ruin a Nopalry, which is properly established and attended to; some plants, or some of their articulations, may suffer and perish, but the injury is never so complete as that which sometimes happens to the indigo plantations. The Nopal is subject to three kinds of disease, none of which are contagious or pass from one plant to another.

1st. To putrefaction or gangrene.

2d. To dissolution.

3d. The Gum.

All these diseases are local; by cutting off the part which has suffered, just to the quick, we may save the remainder. The gangrene or sphacelus shows itself in the evening or day following, by a *black spot* and circular sphacelus on the surface of the articulations, more or less large and profound. If we raise this black spot, the interior substance sometimes putrefies, and the putrefaction extends and corrupts the other joints.* Scarification of the diseased part, or a total removal, is recommended; the true Nopal of Mexico is, above all, subject to these diseases.

The dissolution is a spontaneous decomposition of the whole interior substance of the plant, whether it be some time in arriving at this state, or the sudden effect of a momentaneous cause, infinitely active. The articulations on entire branches, sometimes the trunk of the plant alone, from an apparent state of health, pass in an hour's time to a state of putrefaction: but a short period before, it was seen decked with green, and of a glossy

* May not this be owing to the removal of the plant from a state of nature, where it grows, generally, in poor ground, to *too rich a soil?* The more man is removed from a state of nature to that of luxury, the greater is the number of diseases to which he is liable. Carbuncles, mortification, &c. &c. are frequently the consequences of luxurious living; and why may not plants be also affected by a change from a poor to a rich soil?

hue, but now it is changed into a sordid yellow.* The shining of the rind disappears. Probe it with a pin, the water issues in abundance; cut it with a knife, and the parenchymatous part appears putrefied; scarification to the quick or sound part is the only remedy. If the root and branches be diseased, root it out, change the earth, and replace it by another plant. The Opuntia of Campeachy is particularly subject to this disease. The *gum* is the third disease to which the Nopals are subject. The part swells through which the gum issues, without the substance or colour of the plant being altered; it forms a fissure an inch or more in size; a liquor oozes from it, and fixes itself in tears like a mealy opaque gum, yellow in the Nopals, and white in those of Castile. These are very subject to this disease. Perhaps the root, which is extremely vigorous, (and being too gluttonous) furnishes more sustenance than what is necessary for the articulations. This sap, accumulating in the uterculi of the plant, produces an effort to discharge itself in an extraordinary way.

It has been remarked, on examining the course of the canal in which it is collected, that the discharge is somewhat white, like milk, and less fluid than the sap, which is generally clear and fluent.

Some of these observations, which I have translated from the French,† are worthy of the attention of medical men; and may, with great truth, be applied to the human system.

We are informed that rats and mice are fond of the Nopal, and that many of the beetle tribe riot on its luxuriant juices.

THE COCHINEAL INSECT.

THE ancients supposed that the Cochineal insect was the product of a plant; the word Coccus signifying a red colour, accord-

* Is not this like some of the diseases to which the human frame is subject in warm climates?

† Traite de la culture du Nopal, et de l'éducation de la Cochenille dans les Colonies Françaises de l'Amérique, &c. Par M. Thiery de Menonville, Avocat en Parlement, Botaniste, &c. &c.

Au Cap-François, Chez la veuve HERBAULT, Libraire de Monseigneur le general & du Cercle des Philadelphes.

ing to Lampride, Martial, and Pliny the elder. Many passages in the works of the latter, show that this naturalist believed in the common opinion, that the Cochineal was a grain, the production of a tree. The celebrated Linnæus retained the word Coccus to designate a family of insects, under the order Hemiptera, genus 9th, the character of which he gives as follows: "Rostrum pectorale; abdomen postice setosum. Alæ duæ erectæ masculis. Feminæ apteræ. Antennæ setaceæ."

Twenty-two species of insects are arranged under this generic definition; in their number, is the Coccus of the Cactus Cochinilifer. The Cochineal has been likewise named, from its resemblance to the Coccinella, an insect of the order Coleoptera. This name is evidently a diminutive of the word Coccus. The Coccus inhabits the Cactus Cochinilifer. The abdomen is flat, the back hemispherical and furrowed by transverse wrinkles, which meet on the belly by a double margin, the superior of which is the least; the skin is of a dark brown. Its mouth is an awl-shaped point, which issues from the middle of the thorax: it has six very short, brown feet, and is without wings. The body of the male is longer than that of the female, of a deep red colour, covered by two wings; it has two antennæ, which are one-third longer than the body; the abdomen is terminated by two bristles or hairs, which divergе like the antennæ; it has likewise six feet, larger than those of the female; its flight is usually confined to a short space; it is called, by the Mexicans, *Grana*. This name is evidently a continuation of the old error, which assigned it a place among the vegetable productions. Two kinds of Cochineal are collected in Mexico, the *Grana* Fina and the Silvester or wild species.

THE SILVESTER.

The Silvester, or wild Cochineal, is sometimes called Grana Silvestra, a name purely Spanish. This name also prevails by custom among the Indians, who believe that it naturally lives on the wild Nopal, and the Tunas of Mexico. The male and female of this insect differ from each other at different periods of

their age. The young Cochineals fix themselves on the articulations of the Nopal, and insert their rostra into the rind. Is the rostrum simply an awl-shaped point? or is it a tubulous body in the form of a trumpet?

Thirty days after the male insect is brought forth, it appears under the form of a handsome fly; its colour is of a deep red, bordering on purple, equally elegant in form, as he is brilliant in attire. He flies a short distance in quest of a female; he is not much embarrassed in making a choice; he turns around a female, accosts her, and pursues the impulse of nature. After the consummation of the union, he dies the same day, often the same hour. *Eight days* after the Cochineal has inserted its rostrum and fixed itself on a plant, the hairs on the margin of its back increase in size and frequently in number. The *white down*, with which the female insect is covered, increases with her age, and adheres firmly to the plant, which sometimes renders it difficult to remove her; a part of the downy substance will remain on the plant. The female is in a proper state for fecundation *thirty days* after her birth. The term of gestation is also *thirty days;* during the first ten days, she increases rapidly, and attains to half the size of a garden pea. The day of her accouchement, she pays the same debt of nature as the male. The insects should be placed on the plants of the Nopalry, as soon as they begin to leave their mothers, as it is impossible to transfer them from one plant to another, after they have once inserted their rostra; on which account, if the Nopal dies, the insects also die. The Silvester being placed on the Nopal, propagates without much care. They may be collected every two months, care being taken to leave a few on each plant to keep up the stock. The downy substance, which remains on the articulations of the Nopal, after the insects are collected, should be rubbed off with a moist cloth. By this means, the eggs and chrysalides of insects that have perished, may also be removed. It appears impossible to collect the Cochineal Silvester to advantage from the *Opuntia with thorns;* the most expert labourer, it is said, would not be able to collect two ounces per day, in consequence of the difficulty which the thorns present; but the same labourer would be able to collect, from the garden Opuntia, several pounds.

The *sowing* of Cochineal, a term used in many French and Spanish writers, is certainly an erroneous expression, which arose from the belief that the Cochineal was a vegetable grain. *Eighteen months* after a Nopalry has been planted, it is in a state for the reception and nourishment of the insects. The most settled spring month, I conceive, would be the most proper in which to commence the treatment of the Cochineal insect, in our climate. The Nopalry should therefore be planted at a period, when the plants will arrive to a proper age or time of commencing the treatment of the insect; say April, for example. If a Nopalry were planted in September or October, 1810, it would be in a proper state to receive insects in April, 1812, if no accidents should befall the plants. This is necessary, provided a large crop of insects is expected; but small plants will be sufficient to nourish a few. The female insects should be put into nests, as I have already mentioned in a former part of this essay. It is recommended to place the young insects on the plant early in the morning. Not more than two or four mothers should be placed on a Nopal of two articulations. On a Nopal composed of a hundred, two, three or four hundred may be distributed by fours in a hundred nests, or eight to fifty. Particular directions are given on this head; but it appears necessary to put as many only on each articulation as the plant can nourish. We are advised to make choice of the largest females for the nests. The nests should be suspended on the plants and exposed to the sun, that a moderate degree of heat may induce the young insects to quit them; care being also taken to consult their ease in making their escape. The first nest may be placed about a foot, or a foot and a half, from the earth.

Two months after the Cochineals have been placed on the plant, or *one month* after their connexion with the male, the young begin to present themselves. This is the moment when a general collection should be made, preserving a few breeders; no time is to be lost. At this period, friends, neighbours, whole families, young and old, unite to make the collection as speedily as possible; it is a day of festivity in Mexico. Each person is armed with a blunt knife, in his right hand, like that of a dressing case,

by which the insects are raised from the plant, without doing injury to either. They are caught in the left hand, and put on a plate or into a napkin, attached to the body by its four corners. A child of ten years of age can collect ten pounds per day, which, when killed and dried, shrink to three pounds and a half.

The insects are killed by putting them into baskets, of a convenient size, say two feet in diameter and one in depth, for ten pounds. Being covered with a coarse cloth, they are to be immersed in *boiling water;* and must be entirely covered. In this they may remain one, two, or three minutes; it is said that there is no danger of dissolving the insects by this method. The operator should be careful not to wound them, as those that are bruised are very difficult to dry. The water is always more or less coloured, but the loss is trifling. When they are taken out of the water, they should be spread with care on a table, or *plates of brass* or tin, and exposed to the *heat of the sun.* They will generally dry in the course of the day, provided care be taken to turn them occasionally with the hand about mid-day. Should they be not perfectly dry on the first day, they must be again exposed, until all moisture be dissipated, otherwise there will be danger of their spoiling by corruption. Ten persons may prepare two hundred pounds of Cochineal Silvester in one day, without fatigue. This method of killing and drying the *Silvester*, we are informed, is far preferable to heated plates or ovens, by which the grains are frequently burnt.

GRANA FINA, OR THE TRUE COCHINEAL.

The difference of price between the fine Cochineal and the Silvester, indicates the superiority of the one over the other, and invites the cultivator of the Nopal to prefer it. Two Nopals of the same size, being charged with the same species, produce different quantities of Cochineal. That with the fine, always affords one-third more, in weight, than the other, charged with the Silvester. The female Cochineals bring forth young in the same manner as the Silvester, *two months* after their birth, *thirty days* after their union with the male. They appear then about

the size of a small garden pea, a little longer. The body is furrowed from the sides of the stomach and abdomen; the back is convex and streaked by transverse wrinkles, which meet on the belly by a double margin, on which may be seen twelve small hairs or bristles in the young, but which disappear when the insect arrives at the adult state; some only remaining at the extremity of the abdomen. The insects appear *white* at first sight, but strip them of the white powder with which they are covered, and they appear of a dark brown. They have six very small feet, almost imperceptible, buried in the wrinkles of their body; the head or beak is situated in the breast. The young are contained in their mothers, attached, like a string of beads, to one common placenta, under the form and envelope of an egg. They generally die, under this form, if an abortion take place. The female is of the size of a pin's head; the male is less than double this size. The young sometimes remain two or three days with the mother, suspended to her abdomen like a small bunch of grapes, or dispersed on her back or under her abdomen. Pressed by hunger, and having sufficient strength to break the umbilicus, they leave the mother, and place themselves on the Nopals. It has been said that the little Cochineals do not pass from one Nopal to another; this, however, is incorrect, as they have been seen passing along a spider's thread in search of another plant. They fix themselves with their feet and rostrum, which they insert in the rind of the Nopal the same day, or at farthest the day following, after they leave their mothers. The rostrum being broken or distended, they perish like the Cochineal Silvester. *Ten days* after their birth, the females appear covered with a very white mealy substance, almost impalpable. The males at this period are indistinctly mixed with the females, but ten days after, they form cylindrical cases, by which they are defended as they grow; in this they remain concealed until their puberty: the Silvester does the same. This case is somewhat conical, and covered with a white powder. It is by the rostrum that they live attached to the plant. The great exterior difference between the Silvester and the fine Cochineal, which appears equally white, is, *that the fine is covered with a mealy or powdery*

substance, and the Silvester with a substance *resembling cotton;* the former is always double the size of the latter.

Twenty-five days after the birth of a female Cochineal, she casts off her dress: the male also leaves his confinement. This change is frequently at the peril of their lives, because in their movements they are liable to break their rostra, which are firmly inserted in the plant. The female, after this change, appears of a clear brown, but the day following she is again covered with a white powder, and the place which she occupies is surrounded by a white circle of the diameter of two lines: three or four days after, she is in a fit state for fecundation. The male escapes from his concealment, in his nuptial attire, as described under the head of the Silvester. The male of the fine Cochineal resembles perfectly that of the Silvester; there is no difference, except in size, which is double.

TREATMENT OF THE FINE COCHINEAL.

THERE are three things essential in the treatment of the Grana Fina or fine Cochineal:—1st. To procure the largest females of each generation for breeders. 2dly. To distribute them only on the best and most beautiful Nopals. 3dly. To preserve them, during the winter season, in a case, or, as I have mentioned in a former part of this essay, in a *conservatory*, where they may be permitted to multiply, until the season commences for placing them in the Nopalry; care, however, should be taken, that the increase be limited to the proportion of plants in the conservatory for their support. *Eight days* after the nests are placed on the plants in the Nopalry, or fifteen days at farthest, all that remain without bringing forth, should, with the nests, be removed, otherwise they will serve to invite destructive insects. The Cochineals which are dead, or have not brought forth, should be passed through boiling water, that they may dry quickly when exposed to the sun. These are not considered lost; they may be mixed with the crop and sold, as they are not deprived of their colouring matter. It is said that *two females*, placed on branches of the Nopal in a conservatory, will be suffi-

cient for a stock; the produce of the first generation being *three hundred;* the *second* will amount to 1,800,000: hence the necessity of apportioning the insects, according to the number of Nopals in the conservatory. The fine Cochineals are collected at the same period, in the same manner, and undergo the same process, in the killing and drying, as the Silvester, which has already been described. The time of collecting them being a period of consequence, I will repeat, in this place, what is considered essential to produce a good crop. As soon as the females *commence* the important work of bringing forth their young, which is generally a day, sooner or later, than *two months* after they have been placed on the Nopals, no time should be lost in making the collection. This period should be attentively watched. If the females be permitted *to disburden themselves*, you will lose the crop; their bodies will be *light and empty*, will possess little colour, and soon die: on the contrary, if you make the collection at the moment, when they have arrived to the full period of their gravid state, they are heavy and possess more colouring matter, every little insect or egg in the body possessing the same colouring properties as the mother; hence much of the profits of the cultivator depend on seizing this opportunity for making a general collection.

I am indebted to the "Cercle des Philadelphes"* for the preceding interesting remarks on the culture of the Cochineal insects. It is my sincere wish that they may prove useful to those who may engage in this branch of industry in the United States.

The Opuntia, Nopal, or Prickly Pear, is not only proper for the raising of the Cochineal insects, but, according to Alvaro, Hernandez, Nunez, and others, it is considered a valuable article in the list of esculent vegetables. The fruit of the Opuntia, "Figas Moriscas," is the principal sustenance of whole families in the Island of Minorca during the month of September. The prickly shrub that bears them *grows wild* among the rocks, and is often used to make fences to the gardens.† I have seen them growing, in great luxuriance, in the vicinity of Algiers and

* Cape-Francois. † Cleghorn's Minorca.

Tunis, but never met with any insects, on their articulations, which resembled the Coccus, though the climate, unquestionably, would favour their propagation. In the Island of Sicily, both the leaves and fruit are eaten; the former are roasted, the latter is brought to market in abundance, and considered by many as a great delicacy, when deprived of the rind; it is generally of a beautiful crimson. The leaves, when roasted or boiled, are also used as poultices to ill-conditioned ulcers. In one instance I was present when a Sicilian physician recommended their application, when warmed, to the right hypochondrium, in a case of diseased liver, as a discutient, but without any benefit as such, for an abscess pointed outwards a few days after the application, which was opened, to the great relief and final recovery of the patient.

Philadelphia, October 1st, 1810.

IMPROVEMENT IN SHEEP.

HAW-THORN, *(near Winchester, Va.) 8th Sept.* 1810.

DEAR SIR,

I HAVE received the first number of the "Archives of Useful Knowledge." I am much pleased with it's plan, and believe it will be the mean of diffusing much valuable information. Supposing that your readers will recieve, with pleasure, accounts of every attempt to develope and improve the internal resources of our country, I send you the following statement.

Two years since, a number of the farmers of Frederick county, Virginia, associated for the purpose of encouraging domestic manufactures, and improving their sheep. Their first meeting, to award premiums, was held on the 22d of May, 1809, when but one member, Mr. Richard K. Meade, exhibited lambs for the prizes. He showed a lamb that weighed 159 lb. on the hoof, and produced 9 lb. 6 oz. of wool, which had been washed on his back.

A second meeting of the Society was held on the 21st of May, 1810, when the following lambs were showed:

		Wt. on the hoof.	*Fleece.*
Mr. David Ridgeway's lamb* (Tom Tackle)		180 lb.	9 3-4
Rich'd K. Meade's	do. - - -	156 :	9
Dr. Rob't Macky's	do.* - - -	169 :	8 1-2
Mr. Phil. Nelson's	do. - - -	160 :	8 1-2
Do. Do.	do. - - -	134 :	8 1-2

These sheep were shorn without the wool being washed on their backs; but it was very clean.

It may be remarked, that hitherto, no kind of attention had ever been paid to the sheep of our county. Neither Mr. Ridgeway nor Dr. Macky ever raised a lamb, before last year, that was worthy of notice. But since the establishment of our Society, and since the inhabitants of our county have *felt* the policy of depending less on foreigners and more on themselves, for the comforts and necessaries of life, the above improvement is already experienced in our flocks.

Mr. Ridgeway, a few weeks since, weighed a couple of *twin* lambs, at five months old. One of them weighed one hundred and fifteen, and the other one hundred and sixteen pounds. They are from his prize ram, Tom Tackle, who was permitted to go to a few ewes last fall. There can be no doubt, respecting the weights of these lambs, as they were weighed by Mr. Ridgeway and his miller, with great care; and Mr. Ridgeway is not only a gentleman of unquestionable veracity, but also of great attention to business.

Besides the above exhibition of sheep, which certainly did great credit to their owners, ten pieces of fine woollen cloth, five pieces of fancy cotton, four pieces of fine flaxen linen, and a piece of blanketing, were shown for premiums. The expectations of the most sanguine members of our Society, were greatly exceeded by many of the above specimens. No idea had been formed, of the excellence, to which our household manufactures had been carried, in the short period of two years. And ocular

* From another account I learn, that these lambs were 1-4 Blood Barbary. —EDITOR.

demonstration convinced the most prejudiced, of the egregious folly, of a longer dependence on foreign workshops for any article of clothing.

LAU: A. WASHINGTON,
Sec'ry to the above Society.

Dr. JAMES MEASE.

ON DISTILLING

APPLE AND PEACH BRANDY.

BY JOSEPH COOPER.

COOPER'S POINT, 22*d Oct.* 1810.

THE great plenty of fruit the present year, and the bad quality of the spirit distilled from it, in the common way, induce me to communicate some observations on that subject.

The first evil is, running it too long in the first 'stilling, which, beside injuring the spirit, will not pay for the time lost, and wood consumed thereby. The second and most injurious is, in rectifying, or second 'stilling; the running it too long, or till the spirit has an ill or disagreeable flavour, which greatly injures the whole that it is mixed with. The third is, want of care to put the liquor into clean casks: the contents of one musty or offensive one, will spoil the spirit of ten times its quantity, if mixed with it. From the experience of more than sixty years practice in distillation, I find it best to shift the receiver as soon as the spirit runs as low as first proof, and to keep the remainder to 'still with the low wines, or till there is a sufficient quantity to fill the still, with the addition of about one third water, which will imbibe much of the ill flavour, and leave the spirit more pure. But to make apple brandy to put into wine, or for other particular purposes, I would recommend filling the still half or two thirds full of good spirit; then to fill it to a proper degree with water, run it so long as the flavour is good, and treat the remainder as before. This operation I call washing; and apple brandy, thus prepared, is preferable, for putting into wine or

cider, to any other spirit whatever; and, for common use, I have been in the practice of reducing high proof spirit with the last running from a cheese of good cider, or water cider, put in previously to the fermentation of the cider. That process will greatly improve the quality of the spirit, especially for mixing with water, and make it more mild to the taste in one week, than a year's age will when managed in the common way. A further improvement may be made in apple brandy, by putting in the still, when rectifying, two, three, or more pounds of sassafras root in what will make a barrel of proof spirit: a sufficient quantity of sassafras will give it the flavour of peach brandy, and in my opinion, if reduced as above, will make it full as good.

Although many persons are opposed to the distillation of cider, from religious principles, it appears to me that spirit is really necessary in many cases; and apple brandy, managed as above, and kept to a proper age, is as agreeable and more wholesome than what is generally procured, at great expense and risque, from other countries. Early-made cider, and that from rotten apples, is unfit for other purposes.

JOSEPH COOPER.

LUXURIANT NATIVE GRAPE VINE,

AND ON WINE MAKING.

IN the year 1777, Joseph Cooper, Esq. of New-Jersey, noticed a native grape vine* in his neighbourhood, that covered a red cedar tree, so as to have the benefit of both sun and air, and the fruit on the south and south-west parts being unusually fine, and ripening early, he was induced to plant a cutting from it near his garden, where it grew for several years on a small arbour in a neglected state, bearing a few grapes of a good quality. He then pruned the vine, enlarged the arbour, and spread the vine thin and regularly on it, and secured it by tacking and tying,

* It is the *Vitis Occidentalis* of Bartram, or Blue Bunch Grape.

to prevent its being displaced by wind, which is very injurious to vines. The growth of the vine and the quality of the grapes soon exceeded his expectation, and induced him to enlarge the arbour to the size of 60 by 40 feet, the whole of which the vine covered; he then extended his garden fence, so as to take it in, and manured under the vine by water from the barn-yard; and although the ground under the vine was covered with a strong sward of grass, which gave him three middling cuttings of grass, the vine produced the following crops of grapes.

In the year 1807, it yielded 36 1-2 bushels of grapes: 3 1-2 of the best were eaten and given away; the remainder were pressed, and yielded 91 gallons of juice: to the pumice, a small quantity of water was added, and on being pressed, 26 gallons more of juice was obtained. Both parcels were made into wine, three bottles of which were presented to the Agricultural Society of Philadelphia, and found excellent. Some of it had been made with sugar, and some without.

In 1808, the fruit was destroyed by rose bugs and drought.

In 1809, the vine yielded 26 1-2 bushels of grapes, and made 85 gallons of juice; water was added as before to the pumice, and the liquor which then flowed upon pressure, was mixed with the first running. The wine was tart at first, but grew sweeter as it advanced in age.

In 1810, it yielded 42 1-2 bushels of grapes, at one picking. Some had been previously taken off. A bushel of bunches weighed 34 lbs. Instead of water, Mr. Cooper added about 20 gallons of cider to the pumice, and mixed the produce of the first and second pressings: 150 gallons were thus obtained. Time only, can show the effect of this novel combination.

One year he omitted water, and fermented the pure juice; but the next year, owing probably to the quantity of tartar which it had deposited being re-dissolved, notwithstanding the cask had been well rinsed, and with gravel, after racking, it became tart, and he was induced to distil it for brandy, the quality of which was excellent. The addition of brandy to the wine when fermenting, increased the acidifying process. The wine was racked three times into a tub, but always returned to the same

cask. If a fresh cask had been used, probably the acid fermentation would not have come on. But the same cask is preferable. Mr. C. thinks that if water be added, there will be no danger of a second fermentation from the deposition of tartar.

A great advantage of the native species of grape in question over foreign grapes is, that the vine of the former is not injured by frost; whereas a slight frost destroys both the fruit and vine of the latter. Hence our native grape may be permitted to remain on the vines so late in the season, as that fermentation will not be affected by too great a heat. Mr. Cooper adds too, that they are not subject to blast or rot on the vines like foreign grapes.

The vine covers a surface of 60 feet by 40, making 2,400 square feet: there are 43,560 square feet in an acre, and consequently an acre would admit 18 arbours as large as Mr. Cooper's; but to allow free circulation of air, 15 would be sufficient, and on this calculation Mr. Cooper concludes, that this number of vines, "planted in a good soil and properly cultivated, would in five, or six years at farthest, cover an arbour as large as mine, and produce more and better fruit than mine does from one vine. And from the product of my single vine (which you have often seen) for several years past, I am confident that an acre of land, properly planted and cultivated with the best native grape-vines that can be found within a few miles of almost any farm-house in New-Jersey, or perhaps any state in the Union, would produce grapes sufficient to make fifteen hundred gallons of wine annually, in the way I have recommended. I need not mention its quality, as you have often tasted it."*

The following directions to make wine, by Mr. Cooper, contain his last improvements:

"I gather the grapes when fully ripe and dry, separate the rotten or unripe from the others, and press for distillation if the quantity is worth attending to; I then open the cider-mill so as not to mash the stems or seed of the grapes; then run them through, put the pumice or mashed grapes on some clean long straw previously made damp, and laid on the cider-press floor, lap it in

* Letter to the Editor, Dec. 8, 1810.

the straw, press it well, then take off the pumice and add some water, or I believe sweet unfermented cider would be better, and answer in lieu of sugar. After it has soaked awhile (but do not let it ferment in the pumice) press as before, put all together, and add sugar till it is an agreeable sweet. I have found a pound to a gallon sufficient for the sourest grapes, and white Havannah sugar the best; but sweet grapes make the best wine without any sugar.

"I have heretofore recommended putting the sugar in after fermentation, but on experience find it not to keep as well, and am now convinced that all the saccharine matter for making wine should be incorporated before fermentation. Previously to fermentation, I place the casks three or four feet from the floor; as the filth works out, fill it up two or more times a day till it emits a clear froth, then check the fermentation gradually, by putting the bung on slack, and tighten it as the fermentation abates. When the fretting has nearly ceased, rack it off; for which purpose I have an instrument nearly in the shape of a wooden shovel, with a gutter in the upper side of the handle; place it so as to prevent waste, and let it dribble into a tub slowly, which gives the fretting quality an opportunity to evaporate, tranquillizes the liquor, and hastens its maturity. When the cask is empty, rinse it with fine gravel to scour off the yeast that adheres to it from fermentation, then for each gallon of wine put in one pint of good high proof French or apple brandy, fill the cask about one-third, then burn a sulphur match in it; when the match is burnt out stop the bung-hole, and shake it to incorporate the smoke and liquor; fill the cask, and place it as before, and in about a month rack it again as directed above; the gravel is unnecessary after the first racking. If the match should not burn well the first racking, repeat it; and if it don't taste strong enough to stand hot weather, add more brandy. I have racked my wine three or four times in a year, and find it to help its ripening; have frequently had casks on tap for years, and always found the liquor to improve to the last drawing.

"Being fully of opinion that our common wine grapes are capable of producing wine as good and as palatable, (prejudice aside)

and far more wholesome, than the wine generally imported at so great an expense; and a supply of that article being very uncertain, I am induced to urge the making wine of all the native grapes that can be procured; and in collecting them, to notice the vines that produce grapes of the best quality, and which are the most productive, as this will enable persons to select the best vine to cultivate and to propagate from. This ought to be particularly attended to, as there are many vines which produce good grapes, but few in quantity, and others very productive but of bad quality: and I believe full half the number that come from the seed are males, and will never bear fruit. The sex is easily distinguished when in bloom, by the females showing the fruit in the heart of the blossom as soon as open, and the male presenting nothing of that kind.

"As the native grape-vine will not grow well from cuttings, the best way I know of to propagate them is by removing the vines, or laying branches in the earth to take root for a year or more, and when rooted remove them, or plant the seeds from the best kinds; and when in bloom dig up the males. If well cultivated, they will blow in three or four years, but will produce different kinds, the same as apples; and I have had some from the seeds superior to the parent."

Mr. Cooper observes in one of his publications:—

"In February or March, previously to the sap's running, I examine and trim the vines, observing which branches will suit best for training to different parts of the arbour, or whatever the vines are to cover; a sufficiency of the strongest shoots to extend, or fill vacancies if wanted; then cut the other side shoots of the last year's growth that appear large enough for bearers, leaving not more than three or four buds or eyes and the diminutive ones; cut the dead and unnecessary old vines, close to the leading branches; then spread the vines regularly over what they are to run on, and secure them from being shifted, by tacking or tying.

"From trials and observations I am convinced, that the greatest error in making wine in our country is, using too much sugar and water for the quantity of fruit. The nearer wine is made

from the juice of fruit, without water, the better, with no more sugar than will make it palatable by correcting the acid, and brandy or good cider spirit to give it strength sufficient to keep through our hot summers. The spirit will incorporate with the wine, so that when it arrives to proper age, it will not be known by its taste that any had been in it."

CATTLE SHOW.

THE fourth show held under the direction of the Pennsylvania Society for promoting the breed of Cattle, took place at Bushhill, on Monday the 2d of October last. The following Cattle were shown:

I. By Aaron Palmer, near Darby.

1. Two large handsome red working oxen, five years old.
2. One brown steer, three years old—1-4 deer—3-4 steer. This animal was bred in the back part of the state of New-York. His dam was produced from a deer and a cow, as appear from the certificate now in the possession of A. Palmer, who procured the above mongrel from Benjamin Norton, a drover.—Weight 5 1-2 cwt.

II. By Laurence Seckel.

3. Three brindle steers, three years old, each supposed to weigh 9 cwt. 3 qrs.
4. Two five year old steers, one red, supposed to weigh 13 cwt.—These are intended to be stall-fed, but were in high order when shown.

III. By Martin Dubbs.

5. Two red steers, four years old—estimated weight of beef 18 cwt.
6. One black pied steer—supposed weight 9 cwt.

V. By George Hopple.

7. One large brindle steer, five years old—weight of beef 950 lbs.

8. One light red do.—weight of beef 800 lbs.

9. Four small steers, five years old, off grass, and in high order.

VI. By Jonathan Clift, Philadelphia County.

10. A large red and white bull, of the Alderney breed, seven years old.

VII. By John Barney.

11. Two red oxen, ten years old, large and in high order, the 4 qrs. of each weighing 900 lbs. by general computation.

12. A light brindle cow, of imported stock, with a very fine calf, nine weeks old.

13. A dark brown cow, and twin calves, remarkably large and fine.

14. A very handsome red milch cow.

VIII. By William L. Fisher.

15. A black cow, about seven years old, an excellent milker; she will retain her milk until about to calve, and was with calf when exhibited.

Mr. Cushman, from Genesee, brought 22 head of stock cattle for sale, which were disposed of at a fair price on the ground.

Mr. Mudge, also from Genesee, brought 128 head of stock cattle for sale, of a superior kind—24 head of which were sold on the ground.

The following Merinos were disposed of by public auction: they were of the Infantado flock, and imported from Spain by Capt. Stewart.

Three rams, for $ 400
Three ewes, —— 375 } each.

Two 3-4 Merino rams, the property of Mr. Howell, were also sold by auction, viz:

One from Col. Humphreys's stock, for $ 100.

One from Dr. Mease's flock, by a ram of Col. Humphreys's, for $ 65.—Both were bought by Mr. C. W. Hare.

Unfortunately the day proved uncommonly warm, which prevented many fine cattle being exhibited, particularly by Mr. J. Hart, Mr. L. Seckel, and others: it was the intention of the for-

mer gentleman to bring forward again his noble steer, shown last April, an account of which was given in the first number of this work, p. 56. Mr. Seckel also intended to exhibit twenty very fine fat steers, an account of whose weights will probably be given in the next number of this work.

The show is to be regularly continued Spring and Autumn, of which due notice will be given in the newspapers.

Drovers, farmers, and others, are invited to encourage the Society in their plan of holding a fair for the sale of all kinds of lean and fat cattle, and for horses, cows and sheep, and of farm-stock in general, on the day of their shows for breeding cattle.

WORMS IN FRUIT TREES.

The following paper appeared in New-York in the year 1808, and the directions given have been tried with various success. Injurious insects are multiplying so fast among us, owing to the negligence of the farmers in destroying them, that any remedy, likely to succeed only partially, is worthy of attention. The Editor will thankfully receive an account of the result of an attention to the plan here recommended.

THE re-appearance of those armies of Caterpillars which infested, and even destroyed, so many of our fruit trees last summer, has this year induced me to make the following experiments:

1. On a young apple tree, at the bifurcation of the first limb, I made a moulding of clay mortar, (about 14 days ago.) On the 3d day, I observed an unusual commotion of the worms; and that they appeared weak, emaciated, and their bright colour much diminished, appearing of a foxy brown. Some of them attempting to descend, when they came to the projection of the clay, fell to the ground. Others, which I suppose had fallen, had re-ascended to the clay; but could not, or would not, pass it, though they appeared perfectly restored to their colour and size.

On the 5th day, I observed that their excrements, which before had seemingly filled the nest, had disappeared. On the 7th

day, the nest also had disappeared, and the worms almost gone, except some dead ones, and a few small, emaciated ones, which were scarcely able to move. On the 9th, the clay being very dry, some fresh looking worms had made a lodgment on the clay, and formed a new web over it. These I displaced, and gave the moulding a coat of fresh mud. They are now entirely gone.

2. On a cherry tree in my meadow, where a vast number of those vermin had nested, and devoured all the leaves, I placed a sod, so as to encompass the trunk, and be supported by the first limb. On the 7th day, the nest remained entire, but filled with dead worms, and but two or three living ones on the tree.

3. On a tree, similar to the last, I placed a sod in the bifurcation of the first limb, without making it to encompass either limb or trunk: on the 7th day, the worms on this were dead likewise.

4. Not satisfied with the foregoing unexpected results, as in the last experiment, I placed a sod, with the earth downwards, (as was the case before) in the second bifurcation of another tree, where I observed a considerable collection of worms on the trunk; but none that I could see had as yet ascended to the limbs: and this morning I observed that they had eaten many of the leaves on the first limb, below the sod, and were ascending in considerable numbers to it. None appeared on the rest of the limbs, though there is room enough for them to ascend without touching the sods.

I do not feel myself warranted in saying that such success will invariably follow this method of preserving our fruit trees; but the experiment is so easily made, that I think it well worth public attention.

N. C.

Whitehall, May 27, 1808.

COMPOSITION

FOR HEALING WOUNDS IN TREES.

From the London "*Repository of Arts, Literature, Commerce, Manufactures, Fashions and Politics, for March* 1809."

I HAVE great satisfaction in submitting to my readers the following communication from Earl *Stanhope*, a nobleman, whose studies have been invariably directed towards the advancement of those branches of useful science, which tend more particularly to promote the welfare of mankind in general.

To the Editor of the Repository, &c.

Berner's street, Feb. 13, 1809.

SIR,

THE subject mentioned in your letter to me of yesterday's date, relative to the *healing of wounded trees*, is certainly very interesting; I will therefore (agreeably to your wish) inform you of my success, and in what manner I have obtained it.

The injury which is done to timber trees, and other trees, from the loss of large branches, occasioned by wind, or otherwise, is much greater than people in general are aware of. Every attentive person may easily perceive the *local* injury which takes place at and near the wound, where the tree becomes evidently rotten; but there is, in addition thereto, a *general* injury to the tree, which is produced in the following manner. When wet gets in at the wounded part, it finds its way downwards, between the solid wood and the bark, through the capillary intervals where the sap rises. As the wet, so introduced, cannot get out, it frequently tends to cause the bark to decay at the bottom of the tree, just above, or at the top of the ground. The capillary attraction, which causes the sap to rise, grows gradually weaker; the tree gets sickly; the tips of its upper boughs become rotten; and that fresh injury lets in more wet, which hastens the *general* decay: so that timber trees of the first size sometimes become hollow, or otherwise unsound, though the whole injury originated, perhaps, from the loss of a single large branch.

To remedy these evils, I have applied to the wounds a composition that I discovered many years ago, and which, when properly used, has succeeded even beyond my expectation; for not only the bark grows over the wounds, gradually pushing off the composition, but even the *white wood*, as it is commonly called, grows under the new bark, so as to produce a radical and a complete *local cure*. Whether the local cure thus accomplished, will, or will not, stop the *general* decay, which proceeds from the united causes I have alluded to, will depend upon the degree of general injury that the tree had received previously to the composition having been applied, and likewise on the number of small branches, or boughs, broken off; inasmuch as a tree can receive, in the manner I have described, the same degree of general injury from several broken boughs, as it may from the loss of one branch of the largest dimensions. Wounds of an uncommon size in the bark of the trunk of the tree itself, have been completely healed by the same means. I have tried this plan on a great number of different sorts of trees, and I have always succeeded, if the composition was properly applied, and in due time: one application of the composition will frequently be quite sufficient, but some trees require it to be applied more than once. The elm, when very vigorous, is, generally speaking, of the latter description, on account of the great quantity of sap which weeps from its wounds, especially when the wounds are of a considerable size.

Oak, beech, chesnut, walnut, ash, elm, cedar, fir, asp, lime, sycamore, and birch trees, are, by an act of parliament of the 6th year of his present majesty, deemed and taken to be timber trees; and by an act of the 13th of the king, poplar, alder, larch, maple, and horn-beam, are also deemed and taken to be timber trees. The trial has been made on the greater number of these seventeen sorts, as well as on yew, horse-chesnut, and apple-trees, on various fruit and other trees, laurels, and shrubs.

If it be wished to saw the limb off, either *close* to the body of the tree, or *near* to it, great care should be taken that the separated limb, in falling, does not tear off the *bark* from the tree itself. This may be accomplished by first separating from the tree

the greater part of the limb, and then taking off the remaining stump, and also by sawing the bark of the limb completely all around before the wood itself is divided. If the limb be a very large one, a rope properly tied to it may be advantageously used, to prevent its injuring the tree at the moment of its being separated from it.

After the broken limb has been sawed off, the whole of the *saw-cut* must be very carefully pared away, by means of a spoke-shaver, chisel, or other sharp tool; and the rough edges of the bark must, in particular, be made quite smooth: the doing of this properly is of great consequence.

When the *saw-cut* is completely pared off, the composition hereafter mentioned must be laid on, hot, about the thickness of half-a-crown, over the wounded place, and over the edges of the surrounding bark: it should be spread with a hot trowel. The most convenient tool for this purpose, is a trowel somewhat similar in form to those used by plasterers, but of a greater thickness (such as of a quarter of an inch) in order to retain the heat the longer.

The *healing composition* is to be made as follows: Take, of dry pounded chalk, *three* measures; and of common vegetable tar, *one* measure; mix them thoroughly, and boil them, with a low heat, till the composition becomes of the consistency of bees-wax: it may be preserved for use, in this state, for any length of time. If chalk cannot conveniently be got, dry brick-dust, which has passed through a fine sieve, may be substituted.

I am, Sir,

Your obedient servant,

STANHOPE.

REMARKS.

The composition of Earl Stanhope, is certainly preferable to the celebrated one by Mr. Forsyth, of lime rubbish, cow manure, and bone dust, which is objectionable from the nature of one of the ingredients, from the difficulty and trouble in making enough of the last mentioned article, and from the frequent re-

newal which it requires, in rainy seasons. Many suppose that there is some particular healing or medicinal property in the composition; but that is not the case; its efficacy depends upon keeping out the air and wet, and any other preparation capable of doing that, will answer as well as that of Forsyth. Mr. Bucknal, a celebrated orchardist, who had the care of the king's garden at Hampton Court, recommended tar and corrosive sublimate: I cannot see the utility of the latter ingredient.

EDITOR.

ACCOUNT

Of the produce of Milk and Butter from a Cow, the property of William Cramp, of Lewes, county of Sussex, England, for one season.

(From Communications to Board of Agriculture, vol. 5.)

IN 48 weeks, viz. from the 1st of May to the 2d of April, the cow produced 540 lbs. of butter, which sold for 1*s.* 6*d.* per lb. except for three weeks, when it brought only 1*s.* 4*d.*: total amount £41 7. The quantity of milk given, during the same time, amounted to 4921 quarts; being measured, when milked from the cow, there must be deducted for cream 540 quarts, leaving 4381 quarts of skim milk as the result; which being sold at one penny per quart, produced £.18 5 1.

Four large waggon loads of dung were made, and valued at 15*s.* per load, thoroughly rotten.

Calf sold for	£. 1 10 0
Total produce	62 12 1
	£.64 2 1

The following expenses were incurred:

Grain consumed inthe summer, during 26 weeks, 3 1-2 bushels per week, at 4*d.* per bushel, . . .	£.1 10 4
Bran, 1 1-2 bushels per week, at 8*d.* per bushel,	1 6 0
	£.2 16 4

Amount of expenses brought over, . .	£.2	16	4
Winter, 26 weeks, grain consumed 8 bushels, at 6*d.* per bushel, ...	5	4	0
Bran, 4 bushels per week, at 8*d.* per bushel, .	3	9	4
Half hundred weight of hay per week, at 5*s.* 6*d.* per cwt.	3	11	6
Rent of land, whereon were raised the lucern, clover, carrots, &c.	3	15	0
Wages of a man, at the rate of £.52 per annum, supposing him to attend ten cows, the tenth part of which is	5	4	0
To the farrier for three drinks at the time of calving, ...	0	6	0
	£.21	6	2

Produce, . .	£.64	12	1
Expenses, . .	21	6	2
Profit, . . .	£.43	5	11

The cow was fed with artificial grasses, sown on the following measured plats of ground:

	Roods.	*Perches.*	
No. 1. A plat sown with red clover and rye grass, containing	0	19	
No. 2. Do. sown with lucern, . . .	0	2	
No. 3. Do. sown with cow grass and white clover,	0	17	
No. 4. Do. sown with red and white clover,	0	18	
No. 5. Do. sown with lucern, . . .	0	10	1-2
No. 6. Do. sown with carrots, . . .	0	2	1-2
	1	29	

FOOD AND TREATMENT.

The grass was cut and given to the cow in a rack, in her hovel, where she had a plat of about 18 square perches to range in. During the summer, she was fed on the above, three or four times a day, and at noon about 4 gallons of grain and 2 of bran, mixed; always observing to give her no more food than she

eats clean. During the winter, she was fed on hay, bran and grain, mixed as before stated, and five or six times a day, giving her food while milking.—The manger kept clean, and food never permitted to sour: and particular care taken to milk regularly and clean. Her udder was washed at milking times, with cold water, winter and summer. She was dry only 17 days. The cow was bred in Sussex, from a cow of the same county.

The Agricultural Magazine of Dr. Dickson, No. 1, published July 1807, gives the following account of the second year's produce of milk and butter, of this extraordinary cow:

Butter sold, 450 lbs. . .	£.32	9	6
Skim milk, 3687 quarts, at 1*d.* .	15	7	3
Sold the calf for . . .	1	10	0
Value of Manure, . . .	2	0	0
	52	6	9
Expense of keeping, . .	21	10	8
Profit, ...	£.30	16	1

EXPERIMENTS MADE AT THE EARL OF CHESTERFIELD's DAIRY,

Bradby Hall Farm, in the months of May and June, 1807 *and* 1808.

TABLE 1st.

Showing the Produce of three Milkings of each of the stated Breeds and Crosses.

PRODUCE OF THREE MILKINGS.

BREEDS AND CROSSES.	Milk.		Cream.		Butter.	Milk.		Pressed.	Cheese Curd.
	qts.	pts.	qts.	pts.	ozs.	qts.	pts.	lbs.	ozs.
Holderness	29	0	2	0½	38½	29	0	8	5
Long Horn	19	0½	2	0	26	19	0½	7	3½
Devonshire	16	1	1	1	28	16	1	5	9½
Alderney	19	0½	1	1	25	19	0½	8	8½
Devon and Holderness Cross	25	0	2	0½	32	25	0	8	3¼
Devon and Long Horn Cross	28	0	1	2	29	23	0	9	0
Devon and Alderney Cross	12	0	1	0½	21½	12	0	5	0

TABLE 2d.

Showing the Produce of five Quarts of Milk, taken from the Milkings of the different Cows of each of the stated Breeds and Crosses.

BREEDS AND CROSSES.	Milk.	Butter.		Milk.	Pressed Curd Cheese.	
	qts.	ozs.		qts.	lbs.	ozs.
Holderness	5	7		5	2	4
Long Horn	5	$6\frac{3}{4}$		5	2	6
Devonshire	5	$8\frac{3}{4}$		5	2	$9\frac{1}{2}$
Alderney	5	$9\frac{1}{2}$		5	2	4
Devon and Holderness Cross	5	$8\frac{3}{4}$		5	2	10
Devon and Long Horn Cross	5	8		5	2	$9\frac{1}{2}$
Devon and Alderney Cross	5	9		5	2	4

The Breeds and Crosses placed in Rotation according to the quantity of Food they eat.

First, Holderness.
Second, Devon and Holderness Cross.
Third, Long Horn.
Fourth, Devon and Long Horn Cross.
Fifth, Devonshire.
Sixth, Devon and Alderney Cross.
Seventh, Alderney.

REMARKS ON THE CROSS BREEDS.

The Devon and Holderness crossed produce a valuable stock, (very much resembling the Hereford) of a large size, hardy, kind feeders, and the meat of an excellent quality.

The Devon and Long Horn Cross are not so large as the former, but very hardy, are kind feeders, and the meat of a good quality.

The Devon and Alderney crossed, produce a very valuable stock; they are of a moderate size, much improved in symmetry, hardy, have a great propensity to fatten at an early age, when upon indifferent food, and the meat very rich.

The land upon which the above experiments were made, is of a middling quality, a mixed soil, and well watered.

REMARKS.

The Editor is indebted for the above paper to an attentive correspondent near London. The Earl of Chesterfield has not been prominent among the amateurs at the Smithfield or Woburn cattle shows, but the above statement evinces his attention to the important subject of the dairy, and displays the judicious principles upon which he conducted the experiments. The determination of the question of the comparative excellence of the various milk breeds in England, or in any country, is highly interesting, and the trouble requisite to insure accuracy in the result, amid the numerous avocations of a farm, can only be duly estimated by those, who have a practical knowledge of the difficulties attending such experiments. The ascertaining the quantity of food eaten by each cow, during the time the experiments were carried on, was essential to the object in view, and in all such experiments, or of fattening, ought never to be omitted. It is to be regretted, that the Sussex or Suffolk polled breed of cows, which stand high as milkers in England, had not been permitted to compete with the others on the occasion. The result of the experiments prove the propriety of the selection of the Devon and Alderney breed, by the Cattle Society, in the premiums offered by them for imported milk breeds of cattle.

ON ENGLISH CATTLE.

THE following letters from Mr. Nicholson and Mr. Chandler are important, as coming from men of well known respectability, and scientific breeders, who have repeatedly gained prizes at the Smithfield and other cattle shows, for the fine stock they have raised or exhibited. They are answers to letters, written for the purpose of bringing to the point the question of the vaunted superiority of English cattle, for which the extravagant prices that are given, justly astonish the American farmer.

The breed of Mr. Nicholson must certainly be a great acquisition in any country, on account of their quick maturity, and the disposition to throw flesh and fat on the most valuable parts; and that American would deserve richly of his country, who would introduce it into the United States: but the candid statement of Mr. Chandler, and that of Mr. Knight, satisfy me, that the Hereford cattle, so much boasted of, are not so profitable as the common stock of our northern states, which, when fattened in our state, daily grace our market, and excite merited applause from the stranger.

Upper Darby, Delaware County, October 25, 1807.

SIR,

IN the "Globe" of May 9, 1807, it is stated, that you have sold your fine bull, for which premiums had recently been obtained from the York and Otley Agricultural Societies, to Wm. Downing, Esq. for one hundred guineas.

To an American farmer, this sum appears highly extravagant, for although the grazier and dairy-man are as well paid for their beef and butter in this part of the United States, as in any country: yet I will venture to say, that your bull might have remained to the day of judgment, if here, without bringing one quarter of the above sum, unless his immense size and extraordinary fatness would be likely to have reimbursed the butcher.*

Presuming that the breed of the bull you sold possessed some particular good qualities, I shall deem myself much indebted for some information respecting him. I especially wish to know in what way the purchaser is to be reimbursed, or to obtain good

* This was strictly true at the time the above letter was written, and even now, the spirit for improving our breed of cattle is only commencing in Pennsylvania.—December, 1810.

interest for his money; because I take it for granted, that farming in England is not pursued upon the principle of sport or fashion, by the majority, but that the object is to obtain as good a return as possible from the land. I am by no means ignorant of the high value set upon particular breeds in England, but I am well convinced that a false judgment, and an imaginary value placed upon them, occasion the high prices at which they sometimes sell. A wealthy man may indulge his whim in giving five hundred guineas for a ram, cow, or bull, because they may be of a certain shape, which this or that great breeder and improver has declared to be perfection; but the honest, hard-working cultivator, will reflect before purchasing, and ask himself, will the ram give me finer wool, or better mutton, than one which I can buy for one or two guineas? Will the cow give me more milk than my own? or will the bull enable me to raise a stock of kindly-working, easily-kept, fast-walking oxen, which, after having done my ploughing for three or four years, will furnish tender, fine-grained beef, marbled with fat on the ribs, rumps and surloins, after one summer's grazing? In forming an opinion of the *real value* of the above animals, these considerations force themselves upon us, and I wish you to attend to them, in the answer I hope to receive from you.

I do myself the pleasure to send you a copy of the premiums proposed by our Agricultural Society, and shall also, if our communication be not cut off shortly, forward the first part of our transactions.

Accept my respects.

JAMES MEASE.

Mr. John Nicholson, Gipton, Yorkshire.

ANSWER TO THE FOREGOING.

SIR,

I RECEIVED your letter dated 25th October, 1807, requesting me to give you particulars respecting the bull I sold, which I will endeavour to explain to the best of my abilities. The first question you ask is easily answered; the purchaser will receive

above one hundred guineas for cows this year, at one guinea each; and there is little doubt but he will do as much for another or two to come: therefore, he will be soon reimbursed, and receive good interest for his money.

You will think that valuable beasts in England are easily to be met with; but it is astonishing the slow progress the breed of cattle makes. I perfectly agree with you, that it is not the high price that makes them better; but their value is so well known amongst experienced farmers, that they will neither sell nor let either cow or bull without a good price. To the butcher in Leeds the difference is material; there is not less than five pence per pound difference in the price of meat in the same beast, and it is very common to see two, of seventy stone each, one of which is worth more by six or seven pounds than the other, by having his chief weights in the carcase or middle, as we call it here, such as the crops,* ribs, surloins, rumps, flanks, &c. which are worth at this time nine pence per pound; the coarse parts (which are light in this sort of animal) about four pence: the other sort of beast is very light in all these valuable parts, but heavy in his neck, shoulders, thighs, &c. with a large head, and great bones, and very little fat on any part: it is well known there is this difference in two steers or oxen. I hope it will be allowed, that a valuable bull must be a great acquisition in a neighbourhood. The bull you mentioned weighed one hundred and sixty stone, fourteen pounds to the stone, *alive*.† Supposed to weigh one hundred and ten stone his four quarters,‡ then three years two months old. He stood on very short, small legs; his breast very great, looks fine; horns the colour of cream; crops, surloins and rumps very flat and quite level, so as that a line would touch them all; his flanks very great, dropping down with the lowest part of his belly. I have a painting of him, which cost seven guineas, and am strongly solicited to have a print. If I can get as many subscribers as will pay for the plate, I will make you a present of one, if you will accept it.

I will take the liberty to relate to you how I came by my breed of cattle. Six years ago I rented a farm, sixty miles north from

* Chines. † 2240 lbs. ‡ 1540 lbs.

here, in the North Riding of Yorkshire, where, for a few miles round, including a part of the county of Durham, prevails, without any doubt, the best breed in England. One of the first improving breeders is Mr. James Brown, of Albrough, near Richmond, whom I had the good fortune to get very intimate with, so as not only to improve my breed, but convince me of its great superiority. As a proof of the perfection of his cattle, I give you the following instance to judge of. In November, 1803, I sold six beasts, all of his own breed, then three years and a half old, for two hundred and thirty pounds seven shillings: or thirty-eight pounds eight shillings each. They were slaughtered at Leeds, by Mr. William Arton, and his book will certify, they weighed ninety-four stone each, 14 lbs. to the stone, the four quarters.* Their hides were sold for three guineas each. Tallow from nine to ten stone each.† This price was rather better than eight shillings per stone, sinking the offal; the general run of the market that day was from six to seven shillings per stone, notwithstanding, the butcher does to this day acknowledge them cheap. There is another great advantage attending the improved breed of cattle, which is, that of easy calving: the cows in general are formed wider in those bones, and the calves have small heads and bones. I have kept thirty cows the last six years, and can say with confidence, I never had any difficulty, and very seldom any assistance to afford them; but where the old breed still prevails, half a village is called together at a cow's calving, and very probably either the one or the other is lost. There is a disorder prevails much here, which is commonly called the milk fever, and numbers of cows die of it. They generally are attacked with it at from four to ten days after calving. I believe it arises from want of proper treatment. The common farrier or cow doctor is sent for, and gives a hot, or what he calls a comfortable drink, which generally terminates with death. I have tried a very simple experiment, for these six years past, as a preventive of this disorder. A few days previously to calving, I give the cows linseed cake, and when calved, give them twice a day, for three weeks, or a month, or till there is no danger of

* 1316 lbs. † 126 lbs.—140 lbs.

the disorder taking place. From its coolness and easy digestion, I firmly believe it prevents the disorder. In my number of cows, for the last six years, I have not lost one; and some of my acquaintance, who have taken the trouble to try that experiment, are of the same opinion. I shall find great pleasure if this, or any other remark I have made, be of the least service to you or your Society.

I have the honour to be, Sir,

Your obedient serv't,

JOHN NICHOLSON.

Gipton, April 12, 1808.

James Mease, Esq. Sec'ry to the Agricultural Society, Philadelphia.

The following is part of my reply:

From the account you give of your bull, he must certainly have been a noble animal, and his good qualities entitled him to the high price at which he was sold. His breed would be an acquisition in any country. But I still much question whether such a price would be warranted in the United States, except in the new settlements, where the raising of stock is a great object.* The truth is, that if we have not such superior animals, we happily have not that bad breed of which you speak, which are difficult to fatten, and that often suffer in calving. Our cattle at four years and upwards, weigh from 500 to 1200, with one wintering on hay, and a summer and autumn grass; and as to cows, it is a very rare circumstance that they require any assistance at calving. In four years, only one of my cows out of eight, experienced any difficulty, and in two calvings since has not had the

* This is a general remark, and true, when applied to the purchase of stock for breed, with an expectation of profit. Individuals in different states, however, have occasionally given higher prices, when anxious to improve. Thus the late Mr. John O'Donnel and Mr. Patterson, of Baltimore, imported a Bull and two Cows from the successor of Bakewell, which cost when landed in America, $2000. Four Cows from Amsterdam cost $602.89. Upon the death of Mr. O'Donnel, the stock were sold, and brought from $150 to $200 per head, at public auction, in Nov. 1805.

least trouble.* The fathers of my farmer and of his wife, who keep many cows, and several others whom I have consulted, agree that difficult births in cows rarely occur. No medicine is given before calving, nor afterwards, unless the cow does not cleanse speedily, in which case it is a general practice to give the same remedy you recommend, viz. flaxseed, but in infusion, with a mess of warm water and bran. How these act, I do not know, unless the genial warmth they excite, causes the separation of the membranes. But the success of them I can vouch for, and it is singular that the same remedy should be resorted to in both countries.

Our beef of the first quality, off grass, and highly marbled, sells readily for 10*d.* 11*d.* and 12*d.* per lb. and late in the winter, or in the spring, if stall fed with Indian corn meal, and potatoes (turnips are never used) 14*d.* 15*d.* and 22*d.* are obtained. The great object with the butchers is, to kill cattle which diffuse their fat through the muscles,and our graziers know well the forms that have that disposition, and that thrive quickly. They uniformly refuse to purchase of the drovers the long-legged, narrow rumped animals (which however are now seldom seen) altho' formerly common, and that still go by the name of the "English breed," probably owing to the importation many years since, of the old bad breed you notice, before the improvements had taken place in English stock. With the view of knowing what forms of cattle are in highest estimation in England, our Agricultural Society imported "Scott's prize cattle," and we were surprized to find none of them differ from what we every day see in this state, except in the article of South Down sheep, which we have not. I have myself a pair of working oxen quite as handsome as those represented in Scott's work. Hence we conclude, that the common breed in England must be bad indeed, when such oxen as are common here, carry prizes at Cattle Shows. The fact of the scarcity of good cattle is confirmed by yourself, and it is really singular, that they should not abound, considering the length of time that has elapsed since the spirit of

* Dec. 1810.—No difficulty has occurred since the above date.

improvement began. Bakewell was known for his attention to the subject, and for the superiority of his cattle full forty years ago, and he was preceded by Webster, and one or two others. Since then, numerous improvers have appeared in various parts of the kingdom, and yet it seems to be necessary to stimulate farmers by high premiums, to adopt breeds which their own interest ought to lead them to propagate. Prejudice must certainly operate with much greater force in England, than in the United States, otherwise fine cattle would be much more plentiful than it seems they are at present; and royalty and nobility would not be required to mix with the crowd at Smithfield to break the force of habit, and to show by a comparison of good and bad breeds, what the farmers themselves ought long ago to have found out. Without wishing to eulogize my countrymen undeservedly, I must say, that had they enjoyed the same advantages in respect to Fowler, Bakewell, Paget, and other scientific graziers, our cattle would long since have arrived at their acmè of perfection, and even under present circumstances, we are making rapid strides, for it is only necessary to show that it is our interest to change our breeds, and the change is made without delay. We have none of those strong prejudices, which cause men to shut their eyes to improvements, from a supposition that their own stock is superior to all others.* They are not kept back by the amount of first advances, provided they see a chance for return of good interest, a consideration which duty to themselves and families require an attention to. They do not deem it right to gratify whim, or pay highly for mere beauty of form. A few examples shall be given in point. An English merchant, residing in this city, some years since imported a cow from England of the Teeswater breed,† at a great price, and soon afterwards wished to dispose of her. He however could not ob-

* The British Agricultural writers generally allow that this prejudice is the great obstacle to improvement in England.—The writer of the report on the agriculture of Westmoreland, drawn up for the Board of Agriculture, states, that a farmer, when asked what breed of sheep they had, replied, "*They are sic as God put on the land: we never change ainy.*"

† She was from the stock of Collins, of Stockton.

tain the price he asked,($200) but a captain of a ship bound to England, agreed to take her back free of cost, as she was then fresh in milk, and she was afterwards sold in Yorkshire to good account. Her form was good, and she herself was an excellent milker, but at the price asked for her here, she would not yield an interest equal to what a farmer would derive from the same sum laid out in four or five common country cows, or in three or four grazing steers. The want of a bull, moreover, of the same breed, or of one equally good, by which her race might have been continued, was another reason for the indifference evinced towards her; for it was risking too much to wait a time to determine whether she bred after herself, or from the bull. On the other hand, the proprietor of several rams of the true Dishley, or new Leicester breed of sheep, at New Brunswick, New Jersey, finds no difficulty in letting them for $150 and $200 per year, to farmers within fifty miles, because they have found out that their descendants fatten with great ease and are finely formed, while the American breed of sheep are difficult to fatten, and are long-legged and narrow-rumped, and because the lambs of the former will bring from three to four dollars at three months old, while those of our own breed will only sell for half that sum. I have crossed the ewes of the Dishley breed with the Merino, for the purpose of improving the form of the latter. Col. Humphreys sells his full blood Merino rams readily for $100, because the wool brings $1,33 per lb. Thus when value is returned, capital is freely advanced.* * * *

P. S. *Dec.* 1810. During the present year, 500, 700, 1000, and even as high as 1500 dollars were repeatedly given in New-York for Merino rams, which shows that the American improver is not deficient in spirit, when objects present themselves, that are likely to remunerate the adventurer. At present the great influx of Merinos has diminished the price, but it is highly probable that they will continue at $100, and at that price no farmer should hesitate a moment about purchasing.

Moreton, near Aylesbury, [Bucks] April 3, 1810.

SIR,

ABOUT a fortnight since I was favoured with a letter from you dated June 22d, 1809, requesting my opinion on the merits of some of the different breeds of neat cattle in this island, which I will now endeavour to give you impartially—But in the first place must beg you to accept my acknowledgment of the high compliment you were pleased to pay me. My profession is *principally* that of feeding oxen for the London markets, and for that purpose have made use of those from most of the distinguished breeding counties.

The Herefords are certainly a very fine breed of cattle; they are good feeders, and when fat, come to very great weights; frequently to upwards of 200 stone, of 8 lbs. They are in general well kept by the breeders, and in confirmation of the statement of Mr. Knight, which you allude to, they seldom plough with fewer than 6 or 8 oxen in a team, or more than a statute acre per day; but the land in Herefordshire is the greater part stiff, and very heavy working. They are in general sold by the farmer at 5 or 6 years old. I should imagine what Mr. Knight means by their being "never fed without much loss to the farmer," to be, that they can always sell them to the grazier to greater advantage (in the state he mentions) to be fed on better land, and nearer the London market, than to feed them themselves, as that must be done chiefly by artificial food, and consequently attended with great expense. They are not noted for speed, and are seldom fed at an early age; the general practice being to sell them as before stated, and then being kept from 9 to 15 months by the grazier, they are considered fit for market, and carry their meat on the most valuable parts, and of a good quality. The Hereford cows are handsomely formed, and very quick feeders, but do not stand in high repute as milkers.

The breed you mention, belonging to Mr. Nicholson, are the Durham, or an improved kind of what we term the short horns. The short horns are principally bred in the north of England, and fed on the rich marshes of Lincoln and Cambridge. They arrive at great weights at an early age, and are mostly sold at

3 or 4 years old, for the use of the great manufacturing towns in the north, and in Smithfield, for the use of the navy, army, &c. as they are very much inclined to be fleshy, and sold at an inferior price per stone to many other breeds. I should suppose it a principal reason of the Durham breed never having been exhibited for a premium, has hitherto in a great measure been owing to the necessity of their having worked at least two years, to qualify them for it, which so very few of them do; and another, the great distance they are from London; but I have no doubt if some few of the best of the Durhams were kept to the same age, and had the same treatment, they would be equal in weight and quality to the *Herefords*. The short horn cows are of a large size, and give a greater quantity of milk than any other breed we have, although not of so rich a quality as some others; they are the kind in general use in the vicinity of London, and others of our large towns, where it is the practice to sell the milk. The long-horned, on which the celebrated Mr. Bakewell bestowed so much attention, produces nice cows, much inclined to feed, and good milkers; but the oxen are coarse, and do not rank high, either for labour or feeding. Here I must beg leave to mention his breed of sheep, which as a long-woolled breed, stand unrivalled. I am happy to hear they have found their way into America, and have not the least doubt of their succeeding well with you. Not being an advocate either for very large animals, or feeding to an excess, I have endeavoured from experience to make use of that description of animals, which pay best for the food they eat, and are the readiest sale when fit for market. I have in consequence of late years used the North Devons. They are the best breed that I am acquainted with for the united purposes of labour and feeding, being very active, fast walkers, quick feeders, of a very good quality when slaughtered, and of a size now very generally preferred in our markets to the very large beasts, being from 100 to 150 stone of 8 lbs. They are worked in yokes, from 4 to 6 to a plough, and plough upwards of an acre per day; indeed they work harder than any other oxen in this country, for Devonshire is a very hilly country. I should suppose when you mention

ploughing near an acre per day with a pair of American oxen, the land must be level, and the soil light. There are very few oxen fed in Devonshire, but are sold generally at 5 years old, into the several grazing counties to be fed. The Devonshire cows are not of a large size, but very handsome forms, quick feeders, and give milk of a very rich quality.* Our largest breeds of animals are not held in that general estimation now which they were a few years ago; as a proof of this, they do not now make so much per stone in the London markets as the smaller kinds of an equal degree of fatness, which has induced me of late years to graze as well as Devons, some few Scotch beasts, for the purpose of going to market in the hot months, being of a smaller size than the Devons; they are good feeders, but not so well adapted to labour. I should suppose a yearling bull would not be procured in either Devon or Hereford, from the first breeds, for less than 100 guineas. It is impossible to give an opinion by which of our breeds of cattle it would be adviseable to attempt the improvement of the American breeds, without knowing their particular properties; but I should think, from your description, they are at present at least a very useful breed, and I congratulate you, Sir, on the prospect of their further improvement, by the establishment of the Cattle Society you mention, and the distribution of premiums, a copy of which you were pleased to say you had sent, but which I unfortunately never received. I do not know of any print being taken of any of our prize cattle, or I should have felt pleasure in sending you a copy.

Any further information in my power to give you, respecting either the breeds of cattle, or other branches of our rural economy, shall with pleasure be transmitted you, and with a particular regard to accuracy and impartiality. If an English farmer *credited* the statement of Mr. Parkinson, I should not think it pro-

* "One acre of very good pasture (says Mr. Conyers,) will suffice for a cow: of middling pasture, one acre and a half: one ton of hay, or rather less, will be consumed by each milking cow in the winter months. Upon an average ten cows give five dozen pounds of butter per week in summer, and two dozen in winter, and a profit of £.13 14*s.* per cow is sometimes made in a year."—See Communications to Board of Agriculture, London, vol. 4.—EDITOR.

bable he would venture on a farming speculation to America; but I think, Sir, you acknowledge he took his example from the worst part of the United States, and I will therefore accept of your kind offer of information, and request you will, if you should again favour me with a letter, inform me of the price of land, both arable and grass, either to sell or let, in either of the preferable states, and conveniently situated for markets, also the average price of meat, corn, and labour. I am happy to learn that the differences betwixt our respective countries are likely to be amicably adjusted, and that they may be so, and that we may long continue on terms of reciprocal friendship with our brethren of the United States, is the wish of,

Sir,

Yours respectfully obliged,

SAM'L CHANDLER.

Mr. James Mease, Sec'ry to the Agricultural Society, Philadelphia.

ON DEOXIDIZING INDIGO.

THE following paper on this important subject is taken from some communications in the "*Tradesman*, or *Commercial Magazine*" of London. Various erroneous statements, explanations and theories, have been omitted, or rectified.

ON DEOXIDIZING INDIGO.*

The London method of dying blue, and of forming the pencilling blue of the Calico Printers.

(Communicated by a London Dyer.)

THERE are various methods practised by the calico printers and dyers to take the oxygen from indigo; the follow-

* To deoxidize indigo, is to bring it back to the same colour, and the same state, with regard to the minuteness of its particles, as it appeared in immediately after its being expressed from the leaves of the indigo plant: this is termed "*springing*" by the dyers. When deoxidized, it passes instantly from

ing is used by the dyers of cotton goods, whose pieces are generally from 24 to 28 yards long, and 6-4ths to 9-8ths wide. Having two vats, each 6 feet deep, 3 1-2 wide, and 6 long, with a light frame to go so easily out and in, and two slides on the two sides to move up and down with hooks on the slides, and on each side of the frame on which they can be fastened by the two salvages at the top and bottom of the piece, (the slides are for the purpose of stretching the pieces, and are moveable, that they may be placed according to the width of the goods); take eight pounds of good indigo well ground, boil each pound with two of potash in one gallon of water for two hours, and then put it in the vat, which you mean to work as your dying vat, having previously charged with water; add four pounds of stone lime* newly slacked, to each pound of indigo, stir it up well, and put two pounds of copperas to each pound of indigo; stir it well again, let it settle 24 hours, when it ought to be fit to work. According to the shade of blue required, add or diminish your indigo, keeping the same proportions of lime and copperas; and when you find it get weaker, add lime and copperas, with often stirring up, until you have exhausted your indigo. The other vat, which is filled with pure water, is to dip the piece with the frame in and out as soon as it is taken from the former one, by which means the colour is rendered regular and level, that is, even and free from stains: for the liquor of the dying vat, when it first receives the air, fixes on the piece, and in taking it out of the vat, runs from the top selvage to the bottom one, and acquires oxygen from the air: thus the bottom selvage would, without that caution, become darker than the top; but this irregularity of colour is prevented by the water vat, as the piece is plunged

the blue to the green state, and springs, as it were, from the bottom of the vat, and becomes equally dissipated throughout. Chevraul, a French chemist, however, has shown, that the indigo exists *in the plant*, chiefly in the state of a *white* matter, which becomes *blue* as it absorbs oxygen. What is termed *springing*, then, appears not to bring the indigo back to the state of a white matter, as it exists in the plant, but to deoxidize, or, in other words, to separate the oxygen, probably to such a degree only, as to produce the green colour.—See Thompson's Chemistry.—EDITOR.

* Chalk is sometimes used, but is not by any means so good.

into it immediately on its being taken out of the indigo vat; it washes off the colouring matter that would lie in loose particles, while, at the same time, the water gives out as much oxygen, to the indigo, as to let what has entered into the interior of the cloth remain.* For dark blues, the water vat may be done without, as the marks caused by the running of the colour are not discovered; but for the light blues, it is indispensable.

There is no doubt but the cloth has an affinity for the indigo in that state, or when it came into the water the dye would wash off; but the cloth impregnated with the liquor equal to the strength of that in the vat, whenever it comes in contact with the atmosphere, these minute particles, by acquiring oxygen, become in an instant larger, and are thus detained in the thread of the cloth; in addition to this, if the cloth should be dipped into the vat again, it keeps the indigo that is on the piece from deoxidizing, and thus retains what it has got.

Indigo is one of the best dying drugs we are acquainted with for the consumer, as when it is on the cloth it is neither affected by acids or alkalis in common use, whilst astringents and iron make no stains; through time it gets lighter by washing and air. The only method to make it as durable as can be, is to have the indigo as much deoxidized as possible, and let the cloth remain in the liquor one hour at least, so that it may penetrate well, and have the liquor so strong that the colour may be obtained with only one or two dips, because the longer the pieces are in the liquor, it penetrates the better into the interior of the thread, whilst the oftener it is dipped and receives the air, and dipped again, it lies more on the surface of the cloth in small particles, and by friction, or washing, or wear, falls off. There have been some dark blues that would rub and beat off as much colouring matter as might dye a good light blue.

It is general after blues are taken out of the water vats to run them through a cold liquor, composed of water and sulphuric acid, so sour that it shall taste in the mouth like lemon juice; this is to take off what iron or alkali the piece may have got in

* It is more probable that the water is not decomposed, but that the oxygen is obtained from another source, viz. from atmospheric air.—EDITOR.

the vat; it also destroys the greenish tinge, and makes it appear of a brighter blue; they are well rinsed out of this sour liquor and washed in a little hot water, which tastes slightly of alum; this also helps the fixity of the colour.

I shall now, sir, give you the method of deoxidizing indigo, as practised by the calico printers, for their pencilling blue:—Take 1 oz. of good indigo, 1-2 oz. orpiment, 1-2 lb. pearl-ashes, 1-2 lb. lime. Mix the lime and ashes together, let them settle, take off the clear ley, boil it to the strength, and quantity of caustic ley you want, then put in the indigo, boil it one hour, take it off the fire, let it cool, and then stir in the orpiment; lastly, thicken it with gum arabic, according to the purpose for which it is wanted.

"Indigo thus treated, penetrates uncommonly well, and is the fastest of all blues; it is even more deoxidized than in the blue vat of the dyer; it ought to be a yellowish brown, and when exposed to the air it changes from a yellow to brown, from that to green, and then assumes a blue. This mode, however, cannot be practised but in pencilling, for were it put upon a block for printing, from the exposure of such a surface to the atmosphere as would be necessary, it would most rapidly acquire oxygen and become blue before being applied to the cloth, and then its particles being enlarged, would lay on the surface and be washed off; likewise the strength of the caustic alkali would injure the printing blocks; however that might be got over if the first could. When the printers use the block in printing blue, they print on the indigo, finely ground, mixed with gum to make it work freely, then dry it; have ready two vats, similar to those first mentioned, each filled with water; with as much copperas in the one, and in the other as much lime, as the water in each will take up; a frame must also be in readiness, like that described above; let the piece be hooked on it, put it in the lime vat, then the copperas vat alternately, till the copperas and lime have deoxidized the indigo on the cloth so as it shall become fixed: this is what the printers call their China blue; it is rather inclined to pale blue, but very durable.

The calico printers sometimes pencil on the top of a yellow, in which case, if copperas be used instead of orpiment, it darkens the astringent.*

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ing is used by the dyers of cotton goods, whose pieces are generally from 24 to 28 yards long, and 6-4ths to 9-8ths wide. Having two vats, each 6 feet deep, 3 1-2 wide, and 6 long, with a light frame to go so easily out and in, and two slides on the two sides to move up and down with hooks on the slides, and on each side of the frame on which they can be fastened by the two salvages at the top and bottom of the piece, (the slides are for the purpose of stretching the pieces, and are moveable, that they may be placed according to the width of the goods); take eight pounds of good indigo well ground, boil each pound with two of potash in one gallon of water for two hours, and then put it in the vat, which you mean to work as your dying vat, having previously charged with water; add four pounds of stone lime* newly slacked, to each pound of indigo, stir it up well, and put two pounds of copperas to each pound of indigo; stir it well again, let it settle 24 hours, when it ought to be fit to work. According to the shade of blue required, add or diminish your indigo, keeping the same proportions of lime and copperas; and when you find it get weaker, add lime and copperas, with often stirring up, until you have exhausted your indigo. The other vat, which is filled with pure water, is to dip the piece with the frame in and out as soon as it is taken from the former one, by which means the colour is rendered regular and level, that is, even and free from stains: for the liquor of the dying vat, when it first receives the air, fixes on the piece, and in taking it out of the vat, runs from the top selvage to the bottom one, and acquires oxygen from the air: thus the bottom selvage would, without that caution, become darker than the top; but this irregularity of colour is prevented by the water vat, as the piece is plunged

the blue to the green state, and springs, as it were, from the bottom of the vat, and becomes equally dissipated throughout. Chevraul, a French chemist, however, has shown, that the indigo exists *in the plant*, chiefly in the state of a *white* matter, which becomes *blue* as it absorbs oxygen. What is termed *springing*, then, appears not to bring the indigo back to the state of a white matter, as it exists in the plant, but to deoxidize, or, in other words, to separate the oxygen, probably to such a degree only, as to produce the green colour.—See Thompson's Chemistry.—EDITOR.

* Chalk is sometimes used, but is not by any means so good.

into it immediately on its being taken out of the indigo vat; it washes off the colouring matter that would lie in loose particles, while, at the same time, the water gives out as much oxygen, to the indigo, as to let what has entered into the interior of the cloth remain.* For dark blues, the water vat may be done without, as the marks caused by the running of the colour are not discovered; but for the light blues, it is indispensable.

There is no doubt but the cloth has an affinity for the indigo in that state, or when it came into the water the dye would wash off; but the cloth impregnated with the liquor equal to the strength of that in the vat, whenever it comes in contact with the atmosphere, these minute particles, by acquiring oxygen, become in an instant larger, and are thus detained in the thread of the cloth; in addition to this, if the cloth should be dipped into the vat again, it keeps the indigo that is on the piece from deoxidizing, and thus retains what it has got.

Indigo is one of the best dying drugs we are acquainted with for the consumer, as when it is on the cloth it is neither affected by acids or alkalis in common use, whilst astringents and iron make no stains; through time it gets lighter by washing and air. The only method to make it as durable as can be, is to have the indigo as much deoxidized as possible, and let the cloth remain in the liquor one hour at least, so that it may penetrate well, and have the liquor so strong that the colour may be obtained with only one or two dips, because the longer the pieces are in the liquor, it penetrates the better into the interior of the thread, whilst the oftener it is dipped and receives the air, and dipped again, it lies more on the surface of the cloth in small particles, and by friction, or washing, or wear, falls off. There have been some dark blues that would rub and beat off as much colouring matter as might dye a good light blue.

It is general after blues are taken out of the water vats to run them through a cold liquor, composed of water and sulphuric acid, so sour that it shall taste in the mouth like lemon juice; this is to take off what iron or alkali the piece may have got in

* It is more probable that the water is not decomposed, but that the oxygen is obtained from another source, viz. from atmospheric air.—EDITOR.

the vat; it also destroys the greenish tinge, and makes it appear of a brighter blue; they are well rinsed out of this sour liquor and washed in a little hot water, which tastes slightly of alum; this also helps the fixity of the colour.

I shall now, sir, give you the method of deoxidizing indigo, as practised by the calico printers, for their pencilling blue:—Take 1 oz. of good indigo, 1-2 oz. orpiment, 1-2 lb. pearl-ashes, 1-2 lb. lime. Mix the lime and ashes together, let them settle, take off the clear ley, boil it to the strength, and quantity of caustic ley you want, then put in the indigo, boil it one hour, take it off the fire, let it cool, and then stir in the orpiment; lastly, thicken it with gum arabic, according to the purpose for which it is wanted.

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salt, would be lost; if on the other hand, it was agitated too long, the different parts would be again mixed and form a new combination, and the salt reacting on the dregs would excite a second fermentation, that would alter the dye, spoil its colour, and make what is called *burnt indigo*. The precaution consists in the attention of the manufacturers from time to time to drawing off a little to examine in a clean vessel; when they perceive that the coloured particles are separated from the rest of the liquor, they leave off shaking the buckets, to allow time to the blue dregs to precipitate to the bottom of the tub, where they are left to settle till the water is quite clear. After the superfluous liquor is run off, the dregs remaining at the bottom having acquired the consistence of a thick muddy liquid, it is then drawn off into a settler; after it is again cleared of its superfluous liquid, it is drained into sacks, from whence, when water no longer filters through the cloth, and it becomes of a thick consistence, it is put into chests, where it entirely loses its moisture, and at the end of three months is fit for sale.

That which is known by the name of *Guitamala* indigo, the name of the place whence it comes, is the most perfect of all. There are several sorts made in the East-Indies, but that from the Isle of Java is the best, but its price renders it little used by dyers. The best ought to float on the surface of the water, and its colour ought to be a very dark blue inclining to violet, bright and sparkling, especially when broken. It may be tried by dissolving a little in a glass of water; if pure, it will mix equally, but if not, it will separate and fall to the bottom; the pounded is much more subject to adulteration than that sold in cakes.

The following account of an essential improvement in the preparation of indigo, is a translation from the French of citizen Balley. It will undoubtedly be heard with astonishment, that although indigo has been manufactured during the space of nearly a century, its preparation still consists in such imperfect approximations, that amongst the best manufacturers, even ten, fifteen, and twenty tubs fail out of a hundred. Sometimes, either owing to want of experience, or the contrarieties of temperature, even a much larger number of tubs fail, and ruin the proprietor;

but through the exertions of the colonial proprietor of St. Domingo, Nazon, a means of preventing this failure is laid down. After describing the first process of cutting and macerating plants, similar to the one before related, he thus proceeds: "To bring the maceration to its ultimate point requires from fifteen to thirty-six hours, according to the temperature of the atmosphere at the time of the operation. It is also necessary to take into the consideration, the quality of the indigo plant, the nature of the soil that has produced it, and that of the water in which it is immersed. The first indication from which it is judged, that the process of maceration approaches its ultimate point, is the sinking of the scum, which has elevated itself into the space of about half a foot, which was left unfilled in the vat. When this scum has become a kind of crust, of a copper blue colour, it is then thought to be sufficiently macerated. However this plan was often insufficient, and there was another method on which greater reliance could be placed; this consisted in drawing off a small quantity of the water, by means of a cock in the lower part of the vat; this being received in a silver cup, notice is taken whether the fecula tends to precipitate itself to the bottom of the cup, from whence the maceration is then supposed to be perfect. Such was the process most generally practised, but it often led into error. To avoid this, we have seen means, which consists in accurately observing the water contained in the cup; five or six minutes after it has been poured therein, it forms round the sides a ring or edge, which is at first of a green colour, but afterwards it becomes blue. So long as the maceration has not produced its proper effect, this ring detaches itself with difficulty from the sides of the cup, but at last it is seen to precipitate and concentrate itself at the bottom of the vessel, always toward the centre, under the water, which is become limpid, though with a yellowish tinge. When these appearances are observed, they infallibly indicate the success of this first operation. The water is then drawn off into a second bason or tub, placed beneath the first. This second tub is termed the *batterie*, as its use is for beating the water, still charged with the fecula. In order that it may separate quickly, it is agitated, either by hand labour or the pow-

er of a mill, taking care not to agitate it too long, in which case the fecula would be remixed with the water, and instead of indigo, nothing more than muddy water would be produced; but to avoid this, it only requires attention. It is afterwards drawn off from the *batterie*, to a third or smaller receiver, called the *diablotin;* we then find the *batterie* covered with a very liquid blue paste, which is put into bags of coarse linen cloth of the form of inverted cones, which suffer the watery parts to run off; these bags are afterwards emptied of their contents upon tables in the drying rooms, where this blue paste is kneaded, and after it has acquired a denser consistence, it is spread out and cut into small squares, in order that it may dry the sooner; after which it is ready for sale.*

A set of experiments on the solution of indigo, in different kinds of sulphuric acid [oil of vitriol] were made by Mr. Bucholz, in 1805, who found that the British sulphuric acid was a bad solvent, unless it had been previously boiled with sulphur; that the acid manufactured in the north of Europe dissolved it well in its natural state; but when deprived of the sulphurous acid gas, it became as inefficacious as the English. Hence it appears, that the presence of this gas promoted the solution; of course the common sulphuric acid, in the state in which it is usually employed by the dyers, namely, blackened with vegetable matter, answers their purpose better than the purest.

[For the following original account of indigo, as an article of trade, the Editor is indebted to a commercial friend in this city.]

THE commercial world is supplied with indigo from Manilla, Batavia, Bengal, and Isle of France; likewise from Lima, and Guatimala;—from most parts and ports in the province of Caraccas; from St. Domingo, from New-Orleans, and from South-Carolina. Of all these sources, Guatimala, Bengal, and Caraccas are the most abundant, and their quality vastly superior. Manilla formerly produced a considerable supply, and was once es-

* The above mode of preparing indigo is different from that given by Bryan Edwards in his account of the West-Indies, to which the cultivator ought to have recourse. EDITOR.

teemed on account of the richness of its dye; for some years past it has decreased in quantity and quality. Batavia does not afford a quantity worthy of mentioning, and its quality is various.

Bengal manufactures a very large quantity; when exported it is packed in chests, weighing from 100 to 250 pounds net; it is subject to sworn inspection, and differs more in price than any description of indigo. I have seen Bengal indigo not much inferior to the very best of Guatimala, but the general run of their first qualities is about equal to the *Sobriente* of Caraccas: their middling is equal to Isle of France; and their inferior ranks with that made at New-Orleans. Bengal indigo finds a ready sale at most of the European markets; it is put up in square pieces.

The Isle of France formerly produced a considerable supply, but the effects of the revolution have reduced the quantity so, that the Island is not any longer looked to for any supply of consequence.

The interruption of trade with Lima, occasioned as well by the present war as the revolutions in old and new Spain, has prevented any supply of indigo from that quarter.

Guatimala has long afforded to the commercial world, a very extensive and rich supply of indigo. Its quality, generally speaking, is superior to all others; and there appears to be more *dye* and *better colours* produced from this indigo: when prepared for use from the *vats*, its form is in small pieces of very singular size and shape, but remarkable for their firmness and consistency; its package is in *seroons*, a species of bale made from a hide, and originally shaped when the skin was in a humid state; their weights are various, from 100 to 240 pounds Spanish weight. Indigo at Guatimala is subject to inspection, and the seroons have marks, descriptive of their various qualities.

The qualities are *Flora*, *Sobriente*, and Cortes—the meaning of which as well describes their value as their colour. Flora, or *Fleur*, is that indigo which produces the most exquisite blue; and which, on being pressed between your fingers, instantly pulverizes into the finest particles. Of this quality, their inspectors make three grades.

The second quality, *Sobriente*, signifies *purple;* its dye is not either as rich or as deep in colour as the *Flores;* but as the quantity is much larger than the first sort, and as its application is more various, this description of indigo meets with a more ready sale. Inspectors make likewise three grades of this quality.

The third quality is called Cortes, which signifies *copper*. It is the lowest kind of indigo, and used for inferior purposes; it is liable to the same remarks on the subject of inspection, as the two preceding.

In times of peace, the indigo produced in this extensive part of the Spanish dominions, is all shipped to *Old Spain:* it is transported from Guatimala to *Bodigas Altas* in *Gulfo Dulce;* and from thence carried to the mouth of that wonderful largoon which empties itself into the Bay of Honduras. Ships of 100 guns can lay with safety off the entrance, but none can enter that draw more than from 5 feet 6 inches to 6 feet water. When over the bar, there is 15 fathom water.

Caraccas indigo, as it is generally called, from being the produce of that extensive province, is shipped from La Guira and Porto Cavello, and generally from all the ports in the Spanish Main. The quality of this indigo is somewhat inferior to that of Guatimala; but this difference is not great, as the European prices current will prove. There is an inspector at Caraccas; but since the existence of the present war, I have seen large quantities without the inspector's mark. There are three qualities, and of these the inspectors make on the two first three grades, and on the last two, the following marks:

1st.	Flores, . . .	F
	Flores, . . .	F 1-2
	Flores byo, . .	B
2d.	Sobre or Sobriente, .	Cor. 1-2
	„ .	S 1-2
	Sobres d . . .	S
3d.	Cortes 1-2 . .	C 1-2
	Cortes . .	C

In purchasing the article, where an inspection has taken place, these marks may prove very serviceable. The seroon generally

weighs 112 lbs. to 113 lbs. and when it is heavier, it is a sign that the quality is inferior. The quantity produced is immense, and the sale is at all times brisk.

The indigo from St. Domingo has entirely disappeared, occasioned by the revolutionary struggles in that Island.

The quantity produced from New-Orleans is now insignificant, and its quality so far inferior when compared with Guatimala, Caraccas, and Bengal, that it ceases to be an object with the Louisiana planters.

Carolina still produces indigo, and in a manufacturing nation like Great-Britain, where there are so many inferior goods made, and in the working up of which economy is so needful, Carolina indigo still finds a ready sale, but at a very reduced price.

Taking ten as the scale of perfection, I suppose the different grades of indigo thus to rate:

Guatimala,	1st	quality,	9——	Isle of France,	6——
	2d	—	8——	Manilla,	7——
	3d	—	7——	New-Orleans,	5——
Caraccas,	1st	—	9——	Carolina,	4——
	2d	—	8——		
	3d	—	6——		
Bengal,	1st	—	9——		
	2d	—	7——		
	3d	—	6——		

R.

SUBSTITUTE FOR VERDIGRISE,

AND ON THE MAKING VERDIGRISE.

From the "Tradesman."

WHEN I was making acetate of alumine, or what dyers call red mordant, the high price of French verdigrise occurred to me. I made a small experiment, and I think an article might be made for dyers and hatters, who use a quantity of it, at little more expense than blue stone, (or sulphate of copper,) which is 10*d.* per lb. and verdigrise is at 6*s.* or 7*s.* The difference

between blue stone and verdigrise (I mean to use the names common among dyers) is not great; they are the same metal, only prepared with different acids; the blue stone is copper, dissolved in oil of vitriol, and verdigrise is copper, dissolved in vinegar; the one a mineral acid, and the other a vegetable one. The last does not injure the cloth so much as the vitriolic acid; the dyer always prefers verdigrease before blue stone. The method I would propose is, to have strong pyroligneous acid purified from the oil, as it is now done, saturated with chalk, till none of its acidity is discoverable; then add liquid blue stone,* [solution of blue vitriol] about new milk warm, stirred well, I think about 2 lbs. of blue stone to 1 lb. of chalk; however, I generally used to know by the taste, which requires time and practice; but what is wanted is to have as much chalk as to take up the acid of the blue stone, and no more blue stone than the pyroligneous acid can hold in solution; a little practice will soon discover the proportions, according to the strength of the acids. The principles on which it acts are these: the vitriolic acid attacks the chalk, unites with it, and precipitates; while the pyroligneous acid unites with the copper in the blue stone, and is suspended.† Thus the clear you have is the same as the liquid verdigrease; this, I am pretty confident, will answer every purpose for which the dyer uses it, and will cost less than one-fifth of the price; and if the clear was taken and evaporated by heat, it would be the same as the verdigrise; however, dyers generally add water to it, so that by making it themselves, they would save the expense of the evaporation."

Thus far the Tradesman, or Commercial Magazine of London.

* Blue stone, or blue vitriol, is known in chemistry by the name of sulphate of copper; verdigrise is the subacetite of copper.—EDITOR.

† The correct rationale is as follows; The pyroligneous acid (which is nearly the same as acetous acid) is saturated with subcarbonate of lime, (chalk;) the carbonic acid is destroyed, and a compound of lime and pyroligneous acid is formed. On adding the sulphate of copper, (blue vitriol,) a double decomposition ensues; the sulphuric acid unites with the lime, and sulphate of lime (selinite or gypsum) is precipitated, whilst the pyroligneous acid combines with the copper, which remains in solution.—EDITOR.

Since verdigrise has attained so high a price in this city, our hatters have employed blue vitriol as a substitute, in forming their black dye. The process was published in the newspapers, by Mr. James Cutbush, chemist, of Philadelphia, and has since been generally adopted. It is as follows:—Dissolve 2 lbs. of white vitriol (sulphate of copper) in a sufficient quantity of water; to this solution add 1 lb. of potash; collect the precipitate, (or powder that falls to the bottom,) which may be washed and dried for use. The liquor which remains is thrown away. In this process, the sulphuric acid quits the copper and unites with the alkali, whilst the copper, being oxidized, is thrown in union with carbonic acid, (fixed air,) which is contained in the potash of commerce, and forms a sub-carbonate of copper. By this means, the sulphuric acid is completely detached, and the new compound will be found to answer all the purposes of the most costly verdigrise in dying; or, if the carbonate be treated with vinegar, a real verdigrise will be found.

In addition to the processes already mentioned, several have been invented in this city. Dr. Jackson has discovered a mode by which the true sub-acetate of copper may be made very economically. It is a fact well known, that in the preparation of verdigrise, copper is corroded by means of the refuse matter of the grape. It is well known, that this process cannot be employed, at least with any advantage, in this country; we have, therefore, to resort to other methods, by which the constituent parts may be united, in one operation; the economy of which is, at the same time, to be considered.

Verdigrise may be made for about 75 cents a pound, by decomposing sulphate of copper with potash, collecting the powder that falls to the bottom, (which will be found to contain acid and water, forming a carbonate and hydrate of copper) and mixing it with vinegar. By exposing this mixture to heat, excellent verdigrise will be formed.

The following mode is also recommended by "one of the trade."*

* From the "Tradesman, or Commercial Magazine." April, 1809.

"The indigo is first well ground, and boiled up with 2 lbs. of potash to 1 lb. of indigo, then 4 lbs. of lime, and 2 lbs. of copperas are put in a vat to 1 lb. of the colour; the water may be either less or more, as the shade may be wanted. The vat is raked up once or twice and let stand 12 hours, and then it ought to be fit for work. The above proportions yield a fine solid blue.

"There are various other ways of springing it, and the methods of the wool dyers are in some degree distinct from that of the cotton dyers; instead of being cold, they use the liquor warm; and it is often 'sprung' or deoxidized without copperas."

OBSERVATIONS ON THE DISTEMPER IN DOGS.

By Edward Jenner, M. D. F. R. S.

(From the Medical and Chirurgical Transactions.)

THAT disease among dogs, which has familiarly been called "the distemper," has not hitherto, I believe, been much noticed by medical men. My situation in the country favouring my wishes to make some observations on this singular malady, I availed myself of it during several successive years, among a large number of fox hounds belonging to the earl of Berkeley; and from observing how frequently it has been confounded with hydrophobia, I am induced to lay the result of my inquiries before the Medical and Chirurgical Society. It may be difficult, perhaps, precisely to ascertain the period of its first appearance in Britain. In this and the neighbouring counties, I have not been able to trace it back much beyond the middle of the last century; but it has since spread universally. I knew a gentleman who, about forty-five years ago, destroyed the greater part of his hounds, from supposing them mad, when the distemper first broke out among them; so little was it then known by those most conversant with dogs. On the continent, I find it has been known for a much longer period. It is as contagious among dogs as the small-pox, measles, or scarlet fever among the human species; and the contagious miasmata, like those arising from the diseases just mentioned, retain their infectious properties a long

time after separation from the distempered animal. Young hounds, for example, brought in a state of health into a kennel where others have gone through the distemper, seldom escape it. I have endeavoured to destroy the contagion, by ordering every part of a kennel to be carefully washed with water, then white-washed, and finally to be repeatedly fumigated with the vapour of marine acid; but without any good result.

The dogs generally sicken early in the second week after exposure to the contagion. It is more commonly a violent disease than otherwise, and cuts off, at least, one in three that is attacked by it. It commences with inflammation of the substance of the lungs, and generally of the mucous membrane of the bronchiæ. The inflammation at the same time seizes on the membranes of the nostrils, and those lining the bones of the nose; particularly the nasal portion of the ethmoid bone. These membranes are often inflamed to such a degree, as to occasion extravasation of blood, which I have observed coagulated on their surface. The breathing is short and quick, and the breath is often fetid. The teeth are covered with dark looking mucus. There is frequently a vomiting of a glary fluid. The dog commonly refuses food, but his thirst seems insatiable, and nothing seems to cheer him like the sight of water. The bowels, though generally constipated as the disease advances, are frequently affected with the diarrhœa at its commencement. The eyes are inflamed; and the sight is often obscured by mucus secreted from the eye-lids, or by opacity of the cornea. The brain is often affected as early as the second day after the attack. The animal becomes stupid, and his general habits are changed. In this state, if not prevented by loss of strength, he sometimes wanders from his home. He is frequently endeavouring to expel, by forcible expirations, the mucus from the trachea and fauces, with a peculiar rattling noise. His jaws are generally smeared with it, and it sometimes flows out in a frothy state, from his frequent champing. During the progress of the disease, especially in its advanced stages, he is disposed to bite and gnaw any thing within his reach. He has sometimes epileptic fits, or quick successions of general, though slight convulsive spasms of the muscles. If the dog survives,

this affection of the muscles continues through life. He is often attacked with fits of a different description. He first staggers, then tumbles, rolls, cries as if whipped, and tears up the ground with his fore feet. He then lies down senseless and exhausted. On recovering he gets up, moves his tail, looks placid, comes to a whistle, and appears in every respect much better than before the attack. The eyes, during this paroxysm, look bright, and unless previously rendered dim by mucus, or opacity of the cornea, seem as if they were starting from the sockets. He becomes emaciated, and totters from feebleness in attempting to walk, or from a partial paralysis of the hind legs. In this state, he sometimes lingers on till the third or fourth week, and then either begins to show signs of returning health (which seldom happens when the symptoms have continued with this degree of violence) or expires. During convalescence, he has sometimes, though rarely, profuse hæmorrhage from the nose. When the inflammation of the lungs is very severe, he frequently dies on the third day. I knew one instance of a dog's dying within twenty-four hours after the seizure, and in that short space of time the greater portion of the lungs was, from exudation, converted into a substance nearly as solid as the liver of a sound animal. In this case, the liver itself was considerably inflamed, and the eyes and flesh universally were tinged with yellow, though I did not observe any thing obstructing the biliary ducts. In other instances, I have also observed the eyes looking yellow.

The above is a description of the disease in its severest form; but in this, as in the diseases of the human body, there is every gradation in its violence. There is also another affinity to some human diseases, viz. that the animal which has once gone through it, very rarely meets with a second attack. Fortunately, this distemper is not communicable to man. Neither the effluvia from the diseased dog, nor the bite, have proved in any instance infectious; but as it has often been confounded with canine madness, as I have before observed, it is to be wished that it were more generally understood; for those who are bitten by a dog in this state, are sometimes thrown into such perturbation, that hydrophobic symptoms have actually arisen from the workings of the

imagination. Mr. John Hunter used to speak of a case somewhat of this description in his lectures.* Having never, to a certainty, seen a dog with hydrophobia, I am of course unable to lay down a positive criterion for distinguishing between that disease and the distemper, in the precise way I could wish; but if the facts have been correctly stated, that in hydrophobia the eye of the dog has more than ordinary vivacity in it, and as the term implies, he refuses to take water, and shudders even at the sight of it, while in the distemper he looks dull and stupid, is always seeking after water, and never satisfied with what he drinks, there can be no loss for a ready discriminating line between the two diseases.

March 21, 1809.

REMARKS.

Every man acquainted with general science, and especially every medical man, knows the high reputation which Dr. Jenner has deservedly obtained as an acute observer, an accurate reasoner, and especially for the introduction of the vaccine disease, which is fast dispelling the loathsome small-pox from the world. They will therefore set great value upon whatever comes from his pen: but it may not have happened to many of my readers who are interested in the subject he has last discussed, to know any thing of his character, and therefore this information respecting it is given to insure greater attention to his remarks.

As all are liable to be bitten by dogs, all are interested in knowing the distinguishing marks between the *distemper* and canine madness, which are so accurately pointed out by Dr.

* A gentleman who received a severe bite from a dog, soon after fancied the animal was mad. He felt a horror at the sight of liquids, and was actually convulsed on attempting to swallow them. So uncontrollable were his prepossessions, that Mr. Hunter conceived he would have died, had not the dog which inflicted the wound been fortunately found and brought into his room in perfect health. This soon restored his mind to a state of tranquillity. The sight of water no longer affected him, and he quickly recovered.

See also Percival's Essays, medical, philosophical and experimental, vol. 2d, page 368*: and Inaugural Dissertation on the disease produced by the bite of a mad dog*—1792*; page* 93—*by the* Editor.

Jenner. It is owing to the want of this knowledge, that much uneasiness has often been suffered by persons bitten by dogs; but what is as bad, if not worse, this ignorance has contributed to the reputation of a variety of nostrums for the cure of the disease in mankind arising from the bite of a dog really mad, commonly but improperly called hydrophobia. Even to name those remedies would be tedious; the fact applies to all nostrums, except to the miraculous Chinese snake stone, so celebrated in certain parts of Virginia, which on being applied to a wound given by a dog not mad will fall off, but if by a dog actually mad, will adhere until it extracts all the venom!!!* *(risum teneatis?)*

The sportsman, and country gentleman, whose amusement so much depends upon his hounds, pointer or spaniel, will consider the value of Dr. Jenner's paper lessened in consequence of no cure being offered for either disease, especially the distemper, which is very fatal in the United States: and this defect I shall attempt to supply.

Taplin, whose writings on the horse are familiar to the lovers of that noble animal, gives a chapter on the disease in question, and after denying the truth of the old opinion, that its seat is in the head, and asserting the inefficacy of the common remedy, viz. a seton in the pole of the neck, says, that it is seated in the throat, stomach and intestines; that obstructions exist in the two latter, and that the proper remedy is to give repeated glysters to relieve them. He tried purgatives by the mouth, but they were rejected: he used the following formula, "without a *single loss.*"

Strong decoction of rue, half a pint;

Lenitive electuary, and common salt, of each a quarter of an ounce;

Olive oil, two table spoonsful—mix and inject warm.

This was repeated every two hours, until a quantity of hardened fæces was discharged; after which the animal took nourishment and recovered. He says that he has "observed hounds, greyhounds, pointers, and the larger dogs, were usually attacked between eight months and twelve: while spaniels, terriers, and the smaller kinds, suffered between four months and nine." These

* Medical Repository, Hex. 2d, vol. 4, page 248.

dates should be attended to, as they will enable owners of dogs to form a probable opinion whether a complaint with which they may be attacked, is the "distemper" or some other disease.

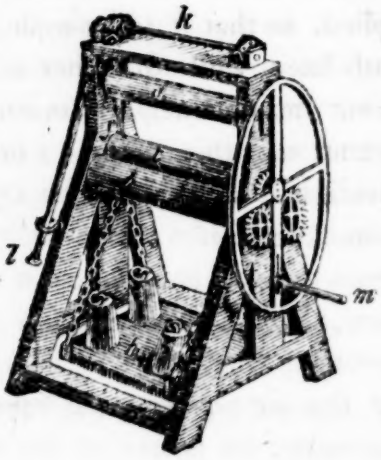
A sporting friend assures me, that he has constantly cured his dogs by freely giving them castor oil and calomel, so as to procure early and copious discharges, in the beginning of the disease, and by rubbing their noses with mercurial ointment. He is of opinion with Taplin, that obstructions in the bowels cause the disease, and adds, that numerous very small worms constantly abound in the fæces. Hence he supposes that they are partly concerned in causing the disorder. EDITOR.

ON MANGLING CLOTHES:

A NEW MANGLE DESCRIBED.

THE business of smoothing clothes, as usually practised in the United States, is a very serious one in a warm day, and many females have laid the foundation for an attack of acute disease, or of protracted ill health, by fatigue and imprudent exposure to a current of air after being much heated by a hard day's duty. To remedy these evils, mangles have been invented. These are long boxes filled with stones or iron, and made to pass over wooden rollers placed on a frame below them, between which the article to be smoothed is placed. There are few families in Europe without one of these useful machines, by which the numerous articles having plain surfaces are smoothed with expedition, and acquire a gloss which cannot be given by flat-irons. They have been partially used in this country, and the great advantages derived from them, ought to cause their general adoption. Several forms have been in use; the last but one is that of Mr. Jee of London, who in 1798, presented to the Society of Arts the model of an improved mangle, which was so constructed that the handle required to be turned one way only. But a friend in this city, who had one constructed precisely upon Jee's plan, found that it worked with difficulty, required great

power, and after many trials he was obliged to have it altered to the old plan, which he finds to answer well. Mr. J. Morris, of Snow-hill, London, has lately obtained a patent for one, of which the annexed figure will give an idea.



DESCRIPTION.

Two horizontal cylindrical rollers form a bed for the roller on which the linen to be mangled is rolled. One of them, *b*, is seen in the drawing. The axis of those rollers bear on brass, let into the wood frame, and have a wheel fixed to each, which works in a pinion on the axis of the fly wheel, as seen in the drawing: *c*, a moveable roller on which the linen to be mangled is rolled: *d*, a roller, the axis of which works in pieces of brass which slide between iron, let into the inner side of the wood frame, to the bottom of which, long pieces of iron, *f*, are fixed with hooks at their lower extremities, to which are attached the chains that support the scale or platform, *h*, where iron weights, or any other heavy substance, are placed; to the top of the brass in which the roller *d* works, the engine chains are fastened, which pass through apertures at each end of the top of the wood frame, and are there again fastened on the pulleys of the shaft *k* with a screw: *l* is a lever fixed to the end of the shaft *k*.

To use the machine, press the lever *l*, and fasten it with the hook, which raises the roller *d* with the platform and weights attached to it; then take out the roller *c*, and roll the linen and

mangling cloth round it, and replace it on the two bottom rollers, unhook the lever *l*, and the weights on the platform will press the roller *d* on the roller *c*; give motion to the fly wheel, and also to all the rollers, by turning the handle *m*, which in a short time will make the linen beautifully smooth; press down the lever, fasten it with the hook, and take the roller *c* out: a spare roller is supplied, so that if two people are employed, one may be filling it with linen, while the other is mangling.

None of the recent improvements in machinery have excited so much general attention as this machine; being constructed on true mechanical principles, and worked by one person with the greatest ease. From experiments which have been tried with it, it is found it will pass over all inequalities without the least difficulty or obstruction, the top cylinders and weights rising and falling as they approach; from the two bottom cylinders being put a little asunder, the one on which the linen is rolled acts as a wedge, greatly increasing the power of the weights, giving the linen three equal pressures. Upon the whole, this machine mangles with greater ease, performs its work better, and with more expedition, than any machine before invented, is very compact in its construction, and never subject to be out of repair.

ON CRIB-BITING.

THIS is one of the worst vices which a horse can contract. The following is the description given of it by Gibson:*

"CRIB-BITING is a vice to which many horses are addicted. It consists in a horse's catching hold of the edge of the manger, sucking in the air, and swallowing it down by gulps, till he is sometimes so full that he is ready to burst. The best way to discover this vice is, when one looks into a horse's mouth for his age, to take notice that his foreteeth are not worn; for when a horse has been long accustomed to this vice, the teeth will not

* Gibson's Diseases of Horses.

meet in some places by the breadth of a finger. A horse never loses this ill habit during his whole life, and indeed all the methods hitherto used to break it have proved ineffectual. Horses that crib are of but small value; they drop a great part of their food unchewed, which causes them almost always to look lean and jaded, with a staring look; and consequently few of them are able to endure much labour: besides, they are subject to gripes and other maladies, which are owing to their continually sucking and filling themselves with air."

It was my misfortune in May 1804, to buy a pair of well-looking horses, 6 and 7 years old, intended for a farm. They were in good order, they moved well, and I saw them repeatedly in the stable, without discovering either of them to be affected by the vice in question. They had not, however, been long at the farm, when one of them was found indulging himself in the habit. Every day it seemed to increase, and in the course of a few weeks, it became a confirmed habit. I then applied to some of the experienced horse masters in Philadelphia, who recommended with one voice, the application of a stout leather strap round the neck of the horse, and drawn so tight as to press upon the wind-pipe. This remedy however was found only a palliative: for as soon as the strap was taken off, he returned to his old practice, and seemed to take more pleasure in the indulgence of it than in eating; for often leaving his pasture, he would walk to the fence, and stand there biting the top rail, and gulping in wind for an hour at a time, until he had swelled his body to much beyond its natural size. In the stable, he would open his mouth when full of oats or short feed, and in like manner seize the edge of his manger, while the food would drop at his feet. Thus from the combined causes of gulping wind and deficient sustenance, he became so weak in the course of a few months, as to give out when drawing me in a chair, to my farm, distant about 6 miles from the city. I applied to the man from whom I purchased the horses, but not receiving satisfaction, I sold the horse at public auction, (declaring the trick he had,) for much less than first cost, and commenced an action against the cheat for the balance. After waiting three years for trial of the cause, the man died.

The horse must certainly have had the trick when I bought him, but by some means was prevented from indulging in it, and thus preserved his health; those means were unknown to me. When upon my determining to sell the horse, I inquired of the *knowing ones* their opinion whether he might not be considered as unsound, I found they were much divided. Some had never heard of the vice; others said it was not usual to include the trick in a general warrant of soundness, and that one of the finest turf stud horses of the time in Virginia, who swept the stakes at Washington City, could be heard all over the race-ground by the noise he made when biting the fence. I concluded therefore that a stud-horse might not be injured by what certainly proved hurtful to a gelding. Others again were of opinion, that any vice which would lead to debility and consequent diminution of strength, ought to be considered as an unsoundness, and might therefore justify the claim of damages. At all events, a deception was practised, and as it was clear that the horse had the trick at the time of the purchase, and soon became deficient in strength in consequence of it, I did not doubt of receiving a verdict in my favour, had the cause been tried. Since that period I have made the freedom from "crib-biting," an indispensable item in the general warranty, when purchasing a horse.

White* says, that the common remedy, a leather strap round the neck, is seldom effectual, and that a better method is to cover the edge of the manger, and every other part the horse can lay hold of, with sheep-skins, the wool side outwards, until the habit is destroyed.

* Compendious View of the Veterinary Art, London, 1802.

METHOD OF CLEANSING

Silk, Woollen, and Cotton Goods, without injury to the texture or colour.

TAKE raw potatoes in their natural state, as when dug out of the earth: let them be well washed, and rubbed on a grater over a vessel of clean water to a fine pulp. Pass the liquid matter through a coarse sieve into another tub of clear water: let the mixture stand till the fine white particles of the potatoes are precipitated; then pour the mucilaginous liquor from the fecula, and preserve this liquor for use. The article to be cleansed should then be laid upon a linen cloth on a table, and being provided with a clean sponge, dip the sponge into the potato liquor, and apply it thus wet to the soiled article, which should in like manner be repeatedly rubbed with the potato liquor till the dirt is perfectly separated. The article should then be washed several times in clean water, to remove the loose dirt; and may afterwards be smoothed or dried.

Two middle-sized potatoes will suffice for a pint of water; and it has been stated, that the white fecula, separated in making the mucilaginous liquor, may be applied as a substitute for tapioca, and make a nutritious food with soup or milk, or may be employed in the manufacture of starch or hair-powder. The coarse pulp, that does not pass the sieve, is asserted to be of great use in cleansing worsted curtains, tapestry, carpeting, and other coarse goods. The mucilaginous liquor of the potatoe will clean silk, cotton, or woollen goods of any kind, without damaging the texture of the article, or spoiling the colour. It is further applicable to the removal of dirt from oil-paintings, or soiled furniture; and dirty painted wainscots may be cleansed by wetting a sponge in the liquor, then dipping it in a little fine clean sand, and afterwards rubbing the wainscot therewith.

The above simple process was invented by Mrs. Morris, (Union-street, Middlesex Hospital, London,) on whom the Adelphi Society of Arts conferred a premium of fifteen guineas, after various satisfactory experiments had been made on fine and coarse goods of various fabrics.

MICHAUX's HISTORY

OF THE FOREST TREES OF NORTH-AMERICA.

MR. F. ANDREW MICHAUX, son of the well-known botanist, who resided many years near Charleston, South-Carolina; has published at Paris, during the present year, a few of the first numbers of his "History of the Forest Trees in North-America," in reference chiefly to their uses in the arts, and their introduction in commerce, and likewise to the advantages which they offer to the governments of Europe by cultivating them. The following is an extract from the prospectus of his work.

"We know that North-America contains in its vast forests an immense variety of trees; those in the United States alone amount to nearly 150, whilst in Europe, we can scarcely enumerate 40. During my residence in the United States, I sent to the administration [of France] numerous parcels of seeds; and I spent the greatest part of my time in collecting all the opinions acquired by experience, on the qualities of woods, and their different degrees of utility in the arts. I have been obliged also to take many journeys, to acquire a greater number of facts, in order to procure all the desired information. Beginning with the District of Maine, where the winter is as inclement and as long as in Sweden; I crossed first all the Atlantic states to Georgia, where, for half the year, the heat is as intense as in the West-Indies. I travelled also more than 1556 kilomètres, [400 leagues] from the north-east to the south-west. I performed, in different latitudes, five other journeys, in the interior of the country: the first, to the source of the river Kennebec; the second, from Boston to Lake Champlain; the third, from New-York to the Lakes Erie and Ontario; the fourth, from New-York to the borders of the rivers Monongahela, Alleghany, and Ohio; and the fifth and last, from Charleston in South-Carolina to the sources of the rivers Savannah and Oconee. In my first journey, along the coast, I stopped in the principal sea-ports, in order to visit the ship-yards, and in general all the shops of workers in wood. I made it a point to consult the most skilful native workmen, and more particularly those from Europe, whom I found capable of

judging of the respective qualities of the different woods found in the two continents. I shall make known those of America, which are the object of a considerable commerce between the central, southern, and northern states, and those which are exported to the West-Indies and to Europe, as well as the interior parts of the country, whence they are derived, and the sea-ports, from which the different exportations take place. I will also point out the best kinds of trees for fuel, and those the barks of which are used for tanning, and give their comparative prices.

" In travelling from the north to the south, I carefully observed, the place of growth and disappearance, of different species of trees, in consequence of a milder temperature, or of a marked change of soil. I gathered, in the different states of the Union, all the common names, to annex them to the scientific appellations. I observed the forests, either as they presented a primitive appearance, or as changed by the vicinity of civilized or domestic animals, the influence of which diversifies so rapidly the face of nature. Such are the principal objects, which attracted my attention, and of which I intend to give an account. I will also faithfully point out the species of trees, which I think useful to propagate for the amelioration of the European forests; and those that only deserve to be introduced into parks and gardens, on account of the beauty of their foliage.

" Such is the outline of the researches to which I have devoted myself, and the result of which I have the honour to offer to the public. I thought that the manner in which I have viewed my subject, in directing my observations to a point of general utility, and which had not been done before, would secure my work in Europe and the United States a more favourable reception than if I had treated it in a scientific point of view.

" The work will be composed of twenty-five numbers. But if, contrary to my expectations, it does not meet with that encouragement, which I hope the importance of the subject entitles it to, and if at any time I am obliged to suspend my publication, I announce to my subscribers, that I have adopted a plan of keeping the genera separate, so that one, two, or three numbers will contain a complete history of one genus of trees, as pines, nut-bearers, maples; so that they will possess so many complete and

separate treatises, which will also give the facility of procuring the particular genera which they may desire. One number will be published every month, and be composed of six coloured plates, with descriptions to each. The plates are engraved from drawings by Messrs. Redouté and Bessa, eminent painters in natural history. The best will be in royal octavo, and printed on very fine paper. The price of each number will be 13 francs and 50 centimes, [$ 2 50.] An edition in English will be published in Philadelphia, accompanied by plates, precisely similar to the French edition, with this difference only, that the common names of trees will be given in place of the botanical ones."

The Editor is well acquainted with Mr. Michaux; has witnessed his assiduity in collecting information from workmen in Philadelphia, and has no doubt of his work proving eminently useful. The execution of the plates will be in the highest style of elegance. Every college and public school ought to possess a copy of this work, and also of the superb work by the father of Mr. Michaux, on the American oaks, which may be bought for the low price of $10. But our seminaries of education unfortunately deem such knowledge degrading, and set a value only on those branches of learning, which are inapplicable to the common purposes of life, or to the business of the world, and which, to nine-tenths of those who get a smattering of it, is totally useless, and forgotten after they leave college or school.

TUBULAR IRON BRIDGES.

A PROJECT has been some time in circulation for the construction of iron bridges, upon a new plan, by J. Joshua Dyster, from England, who, we are informed, is now constructing a bridge of 150 feet span, which is intended to be put up in some convenient place, in or near the city of Philadelphia, in order to exhibit the principles of the tubular bridge, and as a specimen of its advantages over other bridges.

This construction of an iron bridge, is said to be upon an entire new principle, and to possess the following advantages over any yet erected:

That it may be made at less expense, and in half the time which a wooden bridge will require; uniting great durability, with a superior elegance of appearance:

That it may be formed of one single arch, much wider than any present mode of constructing stone or wooden bridges will admit of, sufficient to stretch over most navigable streams, where bridges are required, without any intermediate piers, and will not not need an inconvenient height corresponding to its length; although its extension may be from six hundred to one thousand feet span: And

That it will stand for ages without repairs; being of prodigious strength, the effect of its peculiar principle.

To lay a number of foundations in the beds of rivers, particularly where they are wide and deep, is attended with great expense and labour; and to obtain firm bases for a stone bridge, the laying of the piers is frequently as expensive as all the rest of the superstructure; and if composed of wooden piles, as they must be very numerous, the expense cannot be inconsiderable: therefore, any good and substantial mode which will either require few piers, or supersede them altogether, except the buttresses on each shore, must be extremely valuable and important: the proposer of this system ascribes these properties to his plan.

Piers obstruct the flowing of the tide, and are likewise subject to be affected by the strong and impetuous action of the stream, and by the floating down of timber; and in the winter season, are liable to receive much injury by floating bodies of ice. They are exposed also to shocks from timber, rafts and craft. The truth of these observations is obvious to every one who duly considers the subject. Mr. Dyster says his system obviates these objections.

Public companies or private individuals, who may wish any bridge executed upon these patent tubular principles, are requested to send their letters, post paid, addressed to Joseph Joshua Dyster, *Philadelphia*. These iron tubular bridges may be made from 30 feet to 1000 feet span in one arch, and unite durability with economy.